

SCIENCE

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FOR THE ADVANCEMENT OF SCIENCE.

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FRIDAY, APRIL 26, 1901.

CONVOCATION WEEK.

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THE action of the Association of American Universities recommending the adoption of a 'convocation week' to permit learned societies to hold their meetings at some other period than during the summer vacation has already been reported in these columns. The action was taken in consequence of the request made officially to the Association by the committee appointed by the American Association for the Advancement of Science. The vote determining the recommendation was unanimous, and has now been reported formally to the fourteen universities which are members of the Association making the recommendation. The next step must be the adoption of the plan by our higher educational institutions. It is therefore desirable that all scientific men should understand the project, which may properly claim universal support.

The week proposed is that in which January 1st falls. In some universities, as for example Yale, this week is already included in the regular vacation, so that for them no change is involved. Many universities have already a vacation beginning just before Christmas and extend-

ing to the second or third of the following January. For them the changes will be slight. In those cases in which the two or three days involved cannot, in the opinion of those deciding, be spared, it will probably be practicable to shorten correspondingly one or more of the vacations at other periods of the year. As regards the few colleges and technical schools which do not have the usual Christmas vacation, it may be suggested that it will suffice to vote to grant leave of absence during convocation week to those who desire to attend the society meetings, and perhaps later, when the 'week' has an assured and clearly permanent place these institutions, will conform to what will then be a recognized as a prevailing custom.

Columbia University has the honorable distinction of being the first to adopt the important innovation, and has already changed its calendar for 1901-1902, setting free the week of January first for convocation purposes. It is expected that several other universities also will soon announce their adherence to the plan, and it is hoped that in a short time the majority of American and Canadian universities will adopt the recommendation under consideration.

The reasons for asking for the establishment of a convocation week are obvious, since they are the direct outcome of conditions and experiences which are distinctively American and are familiar to all.

The general proposition that annual meetings of scientific men are desirable requires no demonstration. Every one realizes that, after remaining a long time within the circle of his own university, it is im-

mensely stimulating to meet with a number of other men, pursuing the same branch of science. Moreover, the oral presentation of the results of investigation has certain real advantages over the written form, while the informal discussions at meetings are frequently worth more than the whole cost and trouble of attendance. The gain in these ways and many others is so great for the professors that it must be considered an important part of sound university policy to encourage and promote attendance at scientific meetings, since thereby a university can easily, and often greatly, increase the value of its teaching staff.

It is to be recalled next that attempts to hold meetings in summer time encounter difficulties so serious that such attempts are and can be only partially successful. It is the conviction that this difficulty is great and without remedy which has led the American Association for the Advancement of Science to wish to change its time of meeting to the winter season. It accordingly appointed a committee to take necessary action for this purpose. The committee, of which Dr. Minot is chairman and Professor Cattell secretary, is constituted by Charles S. Minot, President-Elect; R. S. Woodward, President; L. O. Howard, Permanent Secretary; E. L. Nichols and J. McK. Cattell.

The tropical character of the American summer has led to the gradual extension of the national custom of scattering to mountain, seashore and country, and those connected with universities utilize the long vacation to settle down in a summer home, from which it is more than difficult to en-

tice them. It must be further remembered that all those whose studies are with nature—the geologists, botanists, zoologists, anthropologists and others—use the summer for their expeditions, so that for many of them attendance at summer meetings is impossible.

On the other hand, there has grown up within the last dozen or fifteen years the custom of holding meetings of learned societies during the brief Christmas holidays. The first society to adopt this time for its gathering was the American Society of Naturalists, which held its first December meeting in New York, in 1883. Since then a number of other societies, more or less national in scope, have been formed and hold their meetings during the same period. We may mention among scientific societies the following:

- The American Society of Naturalists.
- The American Morphological Society.
- The Association of American Anatomists.
- The American Bacteriological Society.
- The American Physiological Society.
- The American Psychological Association.
- The American Folklore Society.
- The American Society of Plant Morphology and Physiology.
- The Anthropological Section of the American Association.
- The Geological Society of America.
- The American Chemical Society.
- The American Mathematical Society.
- The American Physical Society.

All these societies, we think, without exception, have found from experience that the Christmas holidays are a convenient time for their meetings, except in one respect—that the time is too short, especially when Christmas day falls on a Wednesday or Thursday, for then Sunday falling half way between Christmas and New Year, it is

impracticable to get more than two days for a meeting, and two days, as we have all learned, is far too brief a time for our needs.

These circumstances point obviously to the lengthening of the Christmas vacation past New Year as the remedy, hence the selection of the week in which the first of January falls as 'convocation week.'

Should the proposition be carried out, it will afford an opportunity for the elevation of science in America of inestimable value and will be a contribution to the advancement of learning in all its branches, well worthy to initiate the progress of the new century.

THE NATIONAL ACADEMY OF SCIENCES.

THE annual stated session of the National Academy of Sciences was held in Washington, April 16 to 18 inclusive. The following papers were read:

'The Climatology of the Isthmus of Panama': HENRY L. ABBOT.

'The Effects of Secular Cooling and Meteoric Dust on the Length of the Terrestrial Day': R. S. WOODWARD.

'The Use of Formulæ in demonstrating the Relations of the Life History of an Individual to the Evolution of its Group': ALPHEUS HYATT.

'Artificial Parthenogenesis and its Relation to Normal Fertilization': E. B. WILSON.

'Simultaneous Volumetric and Electric Graduation of the Condensation Tube': CARL BARUS.

'Table of Results of an Experimental Enquiry regarding the Nutritive Action of Alcohol, prepared by Professor W. O. Atwater, of Middletown, Conn.': Presented by J. S. BILLINGS.

'The Significance of the Dissimilar Limbs of the Ornithopodous Dinosaurs': THEO. GILL.

'The Place of Mind in Nature': J. W. POWELL.

'The Foundation of Mind': J. W. POWELL.

'Conditions Affecting the Fertility of Sheep and the Sex of their Offspring': ALEXANDER GRAHAM BELL.

'The New Spectrum': S. P. LANGLEY.

Mr. Alexander Agassiz, of Cambridge, Mass., was elected president of the Acad-

emy; Professor Ira Remsen, Baltimore, Md., foreign secretary; Mr. Arnold Hague, Washington, D. C., home secretary—each for a term of six years. The following were elected additional members of the council for the ensuing year: J. S. Billings, G. J. Brush, H. P. Bowditch, Arnold Hague, Simon Newcomb, L. P. Langley.

Five new members were elected as follows:

George F. Becker, U. S. Geological Survey, Washington, D. C.

J. McKeen Cattell, Professor of Psychology, Columbia University, New York City.

Eliakim H. Moore, Professor of Mathematics, University of Chicago, Chicago, Ill.

Edward L. Nichols, Professor of Physics, Cornell University, Ithaca, N. Y.

T. Mitchell Prudden, Professor of Pathology, College of Physicians and Surgeons, Columbia University.

The following were elected foreign associates:

J. Janssen, Director of the Observatoire d'Astronomie Physique, Meudon, France.

Mr. Loewy, Director of the Observatoire de Paris, Paris.

E. Bornet, of the Section of Botany of the Paris Academy of Sciences.

Hugo Kronecker, Professor of Physiology in the University of Bern.

A. Cornu, Professor of Physics, École polytechnique, Paris.

F. Kohlrausch, Professor of Physics at the University of Berlin.

Sir Archibald Geikie, recently Director of the Geological Survey of Great Britain.

J. H. van't Hoff, Professor of Chemistry in the University of Berlin.

The Henry Draper medal was awarded to Sir William Huggins, of London, for his investigations in astronomical physics.

THE SOCIAL SERVICE OF SCIENCE.*

THE extent to which society may be considered as an organism is still, I understand, a matter of controversy with sociologists, but without awaiting its adjudication, we

*Address of the retiring President, Iowa Academy of Science. Des Moines, December 26, 1900.

may surely make use of a simile as ancient as that of the Apostle who spoke of individual Christians as members of one body, or as that of the wise old Roman who taught the mutinous plebs the parable of the body politic, all of whose members were nourished by the well-fed patrician belly, and consider together this evening the special function of science in the body social.

It may at least supply—a convenient means of classifying the various services of science to the common weal, if we consider it not as a distinct corporal member, but rather as a growth force, ever accelerating the evolution of society, providing it with organs of defense, increasing its muscular energy, and perfecting its systems of circulation and communication. And if to these services we add the reaction upon the social mind of the physical environment which science has provided, and the direct influence of scientific truth, we shall then have sketched at least the main functions of science in social evolution.

Among the first services to society which our biologic analogues suggest is that of defense. Under the growth force of science the body social has accomplished an evolution similar to that which brought the vertebrates, assumed to have been at first naked and defenseless, to the stage of the armored fishes of the Devonian, and which in the Tertiary changed tooth to tusk, nail to claw, and frontal boss to horn and antler.

Prescientific society was destroyed largely because it had attained no adequate means of defense. It is safe to say that had the Roman legionaries been equipped with Maxims and Mausers, the episode of the Hun and Vandal invasions of Southern Europe would have been indefinitely postponed.

Modern society, which science has armed with the most terrible of death-dealing weapons, whose explosives are brought from the laboratory of the chemist, whose im-

mense guns are fired at ranges which require the rotation of the earth to be taken into account, and with a precision which considers the difference in density of the air at the top and at the bottom of the bore, whose war ships are armored with the latest discoveries of metallurgy, their turrets turned and their guns loaded and trained by the electric current, and their evolutions directed by invisible vibrations of ether—surely a society thus armed has nothing to fear from any barbarian peril, be it yellow or be it black.

Civilization is safeguarded by science not only from the irruption of savage hordes, but also from the invasion of disease, from such epidemics as that which in the middle of the 14th century swept away more than half the population of England, and twenty-five millions of people in Europe. To-day when the plague appears in San Francisco or in London, it excites little more alarm than Gibraltar would feel at the assault of the Moor. By the simple remedy of vaccination science has saved in each generation of the century more lives, it is said, than were lost in all the wars of Napoleon. Among civilized nations within the last five centuries the death rate has been so lowered that the average duration of human life has nearly doubled. Medicine no longer attacks disease with charm, exorcism and nostrum; she obtains her weapons from the armory of science. From chemistry she brings a pure *materia medica*, new compounds, new processes, new methods of diagnosis, and anesthetics which have made surgery painless. From physics she obtains the appliances of electro-therapeutics, a delicate cautery, and the Röntgen ray, used by physicians in almost every town of size in Iowa within less than half a decade of its discovery.

The debt of the healing art to the sciences of the biologic group is so vast that I will select but one, bacteriology, for illus-

tration. It is to no lucky chance that the discovery is due of man's most subtle and deadly foes, the bacteria. The work of Pasteur, the pioneer, and of his illustrious followers, is marked by the most thorough and painstaking investigation, and the most searching and rigid tests. It is by the application of the scientific method that the enemy has been unmasked, his ambuscades and chosen places for assault discovered and rational methods for his destruction demonstrated. It is men of science who have organized the victory of medicine to-day over diphtheria, rabies and the plague, over the venom of the snake and all the diseases to which serum therapeutics is successfully applied. And where the bacteriologist cannot as yet supply a specific for disease, he can often point the way to its prevention. When the access to the human system of the germs of typhoid and cholera by drinking water is demonstrated, Hamburg builds its filter beds at a cost of \$2,280,000 and Chicago expends \$33,000,000 upon the drainage canal. And so with the great white plague, tubercular consumption. Science has proved the lurking places of the contagium in the sputum, and its carriage in the air we breathe, and reinforced by the high moral sense of our people, she is fast making it as impossible for the consumptive to spit on the pavement unhindered as for the smallpox patient to walk unarrested down our streets.

And who can estimate the number of lives now saved in each generation by aseptic surgery? So long as putrefaction was held, as by Liebig, to be due to the action of the oxygen of the air, no remedy for it could be suggested; but when once its bacterial origin was proved, the step was inevitable to those precautions which have rendered safe and successful the marvelous operations of modern surgery.

Micro-biology extends her ægis also over

the herds and crops of man. She destroys the insect enemies of our grain fields and protects vine and fruit tree from blight and mildew. She saves the silk-worms of Europe from the plague threatening their destruction, and the flocks and herds of America from some of their most destructive diseases.

Thus science performs a service to society incalculable in its value. It defends it from foes both within and without the gates. It prolongs life, assuages pain, lessens disease and makes death a euthanasia. So notable have been its victories during the century that we may almost prophesy the coming of the time when the only deadly bacillus remaining will be that as yet undescribed species, *bacillus senectutis*, or at least when only sufficient disease will be left on earth to provide for a speedy and beneficent extirpation of the unfit.

Viewing organic evolution from the angle of the physicist and considering the animal body simply as a machine for the transformation of potential into kinetic energy, the secular process sums itself up in the production of better and better machines. From the fish of the early Paleozoic, on to the amphibians of the Carboniferous, the reptiles of the Mesozoic, and the mammals of the Tertiary and of the present, we have a series of higher and higher organisms, each capable of doing more work and better work than its predecessors.

It is possible to construe social evolution in the same terms. Primitive society was weak. The energy at its disposal was that only of the human body, the beast of burden, and, to a limited extent, of wind, water and flame. So feeble was the ancient state in what may be termed its musculature, so little could it utilize the forces of nature, that it may be compared with a stage of organic evolution preceding that of the vertebrata, that, let us say, of the turbellarian worm, 'whose arrangement of

muscles,' biologists tell us, 'is far from economical or effective.'*

In comparison modern society may be likened to one of the higher mammalia, such as the tiger or the elephant, which can not only take up from nature the maximum of energy, but can also apply it in varied movements and a highly complicated conduct.

Consider the vast stores of energy which society has to-day at its disposal. The steam power of the United States alone equals the day labor of one hundred million men. Behind each man, woman and child of the nation stands more than one automaton of steel, with the strength of a man but with manifold his capacity for productive labor. In carding, for example, fingers of steel do in half an hour what the unaided workman of a century ago could not have accomplished in less than eight months. Society finds in machinery a tireless hand capable of performing the mightiest and the most delicate of tasks with equal ease. It strikes with the steam hammer a blow of 2,000 tons, and it rules the Rowland grating with its 48,000 parallel lines to the inch.

Consider also the new induement of energy which science has bestowed upon society in the gift of electricity, a power capable of the swiftest and most ready transmission, of infinite subdivision, and of the greatest known intensity of concentration. And how varied is its functioning. In mine and quarry it picks and drills and fires the blast. At the wharf it lifts and loads and carries. In the factory it forges, casts, welds and rivets. In the home it shines in the most healthful light yet made by man. In electrolysis it produces a hundred substances of value, such as the caustic alkalies, bleaching powder, chloroform, the chlorates, and aluminium, the metal perhaps to give name to the new

* J. M. Taylor, 'Whence and Whither of Man,' Morse Lectures, 1895, N. Y., 1896, p. 47.

century. From the refuse of the mine it extracts millions of dollars worth of the precious metals. It surfaces the common metals with those more beautiful and precious, and copies infallibly the engraved plate of the map and the type-set page. In the electric furnace it creates new compounds, calcium carbide the source of acetylene gas, carborundum the abrasive of the future, and calcium nitrate, which promises a new source of nitrogen to fertilize and renew exhausted soils everywhere. It aids in the synthesis by which the chemist builds out of the inorganic the dye, the perfume, the essence, and soon perhaps the food, which nature builds only by the processes of life. Such are some of the functions of the new muscular system with which electrical science has equipped the body social.

It is not claimed that pure science is the only factor in industrial progress. Invention, business sagacity, and many other causes cooperate. But the work of science is essential, fundamental, creative. How far unaided invention can go may be seen in China. Here is a people once pliant of intellect and inventive. As artificers they still are given high praise. But Chinese invention, destitute of all scientific foundation, stopped with the fire cracker, the movable type and the directive loadstone. It could not possibly go on to the Lyddite shell, the Hoe printing press, and the compass of Lord Kelvin. Invention is applied science, and as has been well said, "science must first exist before it can be applied. Between the scientific investigator, the discoverer of principles, and the inventor who applies them, there need be no jealousy. If the last has the popular fame and the financial reward of the present, it is often to the first that the future belongs, and, in any event, in the words of the generous Schley at Santiago 'There is glory enough for all.' And after all, why should

the name of science be refused to that vast body of knowledge, classified and tested, which is in daily use in the laboratories of the industries of the world.

But to science even in its most restricted sense the debt of society is incalculable. It has evoked those good genii, steam and electricity. Watt was led to the invention of the steam engine, not by a boy's glance at his mother's tea kettle, but through the discovery by Black of latent heat and after two years of profound study of such abstruse problems as the specific volume of steam and its law of tension under varying temperatures. And the improvements in the steam engine, which since the fifties have more than doubled the speed of the piston, while saving at least one-fourth of the fuel, have been made under the guidance of Joule and the mechanical theory of heat. In the matter of the advantage of superheated steam and high pressure, theory still seems to outrun practice.

In electricity the mechanic can take no important step beyond the scientific discoverer. How happy was the thought which designates the various units of electricity by the illustrious names of the masters of research: volt, in honor of the professor in the University of Pavia, who, one hundred years ago, gave the world in his crown of cups its first effective reservoir of the new power; ampère, the name of the professor of physics in the College of France, founder of the science of electro-dynamics; ohm, in memory of the professor of experimental physics in the University of Munich, discoverer of the law of the strength of the electric current; and farad, in honor of the greatest of them all, Michael Faraday, professor of chemistry in the Institution of England, the prince of experimenters, whose researches, resulting in the dynamo, connected the industries of the world with the first economical source of electrical energy.

Illustrations of the dependence of industry on pure science are everywhere at hand. When, as an amateur in photography, I take up a package of eikonogen or hydroquinon, the label with the name of one of the great aniline factories of Germany, at Elberfeld, Mannheim or Berlin, reminds me of the debt of the *Farbenfabriken* to men of research. To the chemist is not only due the discovery of my developers, and of such other by-products as antipyrine, cocaine, saccharine and vanilline; it was he who first found in the black amorphous coal tar, the former refuse of the gas works, those brilliant crystalline dyes which have so largely replaced other colors in the dye vats of the world. So far as I am aware, no monument has been raised to these discoverers, to Hoffman, Graebe and Liebermann. In a more telling way industry acknowledges her debt to pure science when a great aniline factory such as that at Elberfeld employs sixty professional chemists, and turns the attention of twenty-six of them to pure research in discovery of new compounds.

Science has thus given society command of energies of the highest efficiency. It has made the comforts of life common and cheap, it has lifted from the shoulders of labor its heaviest burdens and set free for higher social services all who are capable of their performance. It is the undiminished fountain whence flows the world's material wealth.

The evolution of the circulatory system in the body physiologic suggests a similar development in the body social. The process which during the geologic ages slowly changed the primitive gastro-vascular cavity to the perfected circulation of the higher animals to-day, which evolved from a simple pulsating tube the powerful four-chambered heart, may at least serve as a simile to the evolution of the distributory or transportative system of modern society. So obvious

is the analogy that the arteries of commerce is a phrase of common parlance. But for our purpose it will not be necessary to carry the likeness into details, to discriminate, as some ingenious sociologists have done, the various organs, such as the capillaries of the body social, or to liken the red corpuscles of the blood to the golden discs of the circulating medium. Let it suffice to show that by the application of the discoveries of science society has obtained a system incomparably rapid and effective for the distribution of power, of food and of all the products of labor.

The world is enmeshed by lines of railway and steamship. They carry the products of our Iowa farms to western Europe, to South Africa and to China. To our dinner tables they bring in return linen from Ireland, porcelain from France, cutlery from old England and silverware from New England, meats and fruits from States as distant as Texas, California and Florida, spices from the East Indies, and beverages from Japan and Java and the valley of the Amazon. In the United States alone there are now in operation nearly 200,000 miles of railway carrying each year a billion tons of freight and five hundred and fifty millions of passengers.

The carriage of power is accomplished at present almost wholly by the transportation of fuel. The value of this service may be seen by contrast with some railroadless country such as China, where, according to Colquhoun, coal selling at the mine at fifteen cents per ton costs as many dollars ten miles away. But the future doubtless has in store the distribution of power as an article of merchandise. The possibility of long-distance transmission of electricity has already been demonstrated at Niagara, and the time may be near when in our cities power from coalfield or waterfall may be purchased for use in factory and home as readily as water or gas to-day.

What has been said already of the debt of industry to science in the development of its motive powers applies here equally in transportation. Permit a single illustration further of the value of pure science in the evolution of the circulatory system. Every engineer is aware of the large contribution which the steel rail has made to the success of the railway. Durable, strong and cheap, it has displaced on all our railways the weak and short-lived rail of iron. It has made possible heavier trains and higher speeds. Together with other factors it has so cheapened traction that, according to Professor J. J. Stevenson, the coal of West Virginia is now sold at New York City for less than one-fourth the railway freight charges of a quarter of a century ago. But it is no belittlement of the laurels of Sir Henry Bessemer, the inventor who has made all this possible, to point to the fact that the success of his process, which, by ushering out the Age of Iron, and ushering in the Age of Steel, has revolutionized industry and touched every home with its beneficence, is due not only to his use of a great body of facts in the chemistry of the metals, but in especial to the utilization by Mushet of the facts regarding the influence of manganese and its relation to carbon, facts ascertained in the laboratories of science and left on record to await their use by invention at the proper time.

The mobility in the social organism so largely due to science has had far-reaching effects. It stimulates production to the utmost. It opens the markets of the world to the products of every worker. Labor has itself become mobile, and in the factory raw material from distant lands meets operatives from across the seas. It is the cause of vast migrations, such as that which has brought to the United States more than nineteen and a quarter million people since the opening of steamship routes across the Atlantic. It makes impossible in civilized

lands such famines as that which in 1878 in two of the northern provinces of China destroyed more than nine millions of men. It opens to the occupation of a single homogeneous civilized commonwealth such vast areas as the Mississippi valley. To any such it would be as fatal to stop the social circulation made possible by science, as in a limb of the body to ligate the main artery. Dense populations can indeed exist wherever food can be raised in abundance, as on the river plains of China, but without the modes of distribution introduced by the science of the nineteenth century, they neither can be unified into a homogeneous community nor can they be lifted to the levels of modern civilization.

By its systems of circulation which break down all barriers, science has brought about the supreme crisis in social and political evolution. Like the epirogenic movements which mark the crises in geologic history, which united continents and precipitated alien upon indigenous fauna, science has brought civilization and barbarism the world over in all their stages to meet in a life and death struggle, and offers to the fittest the prize of a world-encircling empire.

The fact that in order to operate the railway it is necessary to send signals at greater speeds than those of moving trains, suggests another service of science—the highest material service which it renders the common weal. In the telegraph and telephone a system is supplied for the almost instantaneous transmission of motor and sensory impulses throughout the body politic. In general terms we may compare the growth of the communicating system of society to the development of the nervous system in the history of animal life, where the scattered central cells of nature's first sketch of such a system are later gathered into ganglia, and ganglia massed into a brain connected with every part of the body by ramifying nerve filaments. Of all social

organs this seems the most retarded in its evolution. In primitive society it is only the smallest groups, such as the family and the village community, which have a facility of communication comparable with that of the lowest of the metazoa. In the larger groups of the tribe and nation we find a stage more advanced than that of the hydra only after science has made possible the railway post and the telegraph and telephone.

That Morse is the inventor of the electric telegraph is a statement more veracious than that of the Vermont farmer who said that everybody knew that Edison invented electricity. But the name of the inventor of every tool of society is legion. Morse set the keystone of the arch, but its voussoirs had been built by investigators unknown to popular fame in many lands, and even the keystone was almost placed in the hands of the distinguished inventor by Henry, the great physicist. And Oersted, who in 1819 deflected the magnetic compass by a voltaic current in a neighboring wire; Arago, whose experiments with iron filings proved that this current would generate magnetism; Ampère with his suggestion of the possibility of signaling at a distance by the deflection of needles; Schweiger, who took up Oersted's experiment, and discovered that the deflecting force of the current was increased when the wire was coiled about the magnet; Sturgeon, who, making use of Arago's discovery, replaced Schweiger's magnetic needle with soft iron and thus constructed the first temporary or soft magnet; Henry, who strengthened the electro-magnet and used it with over a mile of wire to give signals by tapping a bell—all of these men, devoted solely to knowledge for knowledge's sake, are sharers with Morse and Vail in the glory of the invention of the telegraph.

And so with wireless telegraphy. In Marconi's hand this invention blazes with

a sudden brilliance which attracts the attention of the world, but the torch has been conveyed to him along the line of many runners in the torch race of scientific discovery. From Clerk Maxwell, who showed the analogy between electricity and light; from Hertz, with his demonstration of electromagnetic waves; from Onesti of Fermo, and Branly of Paris, and Lodge of London, whose researches produced in the coherer an instrument capable of seeing such waves; from these and others the torch was passed on to the great inventor whose improvements in apparatus made effective the discoveries of science.

In the telephone at least four scientific principles are involved—the voltaic current, the interaction of magnetism and electricity, the temporary magnet and the microphonic action of carbon. Through this marvelous invention each master in electrical science from the time of Galvani who has aided in the elucidation of these principles, though dead, yet speaketh.

Thus we may fairly claim that to science is due in large measure the plexus of post, telegraph and telephone, by which intelligence is flashed throughout the body social even more swiftly than along the nerves of the body physiologic. And how incalculable is the service which science thus renders! Consider the extent of the channels of communication. The domestic mail service of the United States requires each year twenty-one million miles of travel. Sixty-four years ago the first commercial telegraph was built with a length of forty miles. At the close of the century there are not less than one million miles of telegraph in the United States, over which duplex and multiplex messages are carried at the same time, and the rate of transmission has risen to six thousand signals per minute. One hundred and seventy thousand miles of submarine cables moor coasts, islands and continents together. Over one million

miles of telephone wires have already been strung in our own country. Boston, a typical city, measures its electric nerves at a total of one hundred and seventy million feet, and the radius of audible speech from it reached a year since, according to Iles, to Duluth, Omaha, Kansas City, Little Rock and Montgomery.

Note the saving of time and energy thus accomplished. Without leaving his desk the manager of a business is in instant communication with all his employees, and with the business enterprises in his own and other cities. The captains of industry are thus able to command armies of a size unthought of a few decades since. So accurate and instant are the new motor and sensory nerves that the oil refineries, the copper mines, the steel mills, almost any industry that may be mentioned, can be regimented under one control, and an industrial revolution is accomplishing before our eyes.

The electric wire with the fast mail and the newspaper flash the news of the world throughout all civilized countries. When our army attacks Santiago or marches on Peking, the public becomes impatient of even the interval between the morning and the afternoon paper. On the night of a national election the American public listens to the count of votes in every city and in every State. The new discovery of science, the new mechanical process, the new remedy for disease, are communicated without delay to the entire world. In commerce local prices seek the level of the world market, and the entire distributing system is as effectively controlled as are the capillaries of the animal body by the clutches of the nerves. In a theater vast as the whole earth we look down on the stage upon which is played the never-ending drama of current history.

In a still larger sphere the new organ of communication has a reflex on civilization. It makes possible self-governing commun-

ities stretching from the Atlantic to the Pacific and even the federation of the world. Bringing Washington face to face with London, Paris and Berlin, and the other capitals of Europe, it enables the great powers of two continents to arrange without delay a concert of action whose message flashes round the planet and is carried into effect at Tien Tsin and Peking. In direct contrast unscientific China outspreads her bulk like some vast insensate vegetal growth. Under attack, even at a vital point, she can neither mobilize her armies nor even disseminate a knowledge of the danger before it is too late.

It has been said by Giddings that objectively viewed progress is an increasing intercourse, a multiplication of relationships, an advance in material well-being, a growth of population, and an evolution of rational conduct. Subjectively it is the expansion of the consciousness of kind.*

In all these respects science has been an accelerating force in the evolution of society. Increasing food supply by means of scientific agriculture, lengthening life by the repression of diseases, and introducing a thousand new means of livelihood, it has made possible the extraordinary recent growth of civilized nations. It permits the population of Europe to more than double since 1800, and enables England, which in the seventeenth century men thought too small for its scanty population, to support more than 38,000,000 people in comparative comfort. It lends some encouragement to the sanguine prophecy of Albert Bushnell Hart that the Mississippi valley will sooner or later contain a population of 350,000,000.†

At the same time science has produced a heterogeneity of structure. The scientific principle discovered to-day flowers to-morrow in invention and produces the seeds of

* 'Principles of Sociology,' New York, 1896, p. 359.

† 'The Future of the Mississippi Valley,' Harper's Mag., Vol. 100, p. 419.

special arts and crafts. To Volta's researches in his villa on Lake Como five million men now employed in the many various arts connected with electricity owe in a measure their livelihood. In promoting the development of the complex organs of society for the handling of energy, for distribution, and for communication, science has constantly been a differentiating force.

By the same means it is accomplishing a more and more complete integration. The separate life of primitive society, the old personal independence, is gone. In the new order all social units and aggregations are interdependent. We are all members of one body. We must not ignore the purely psychic factors of social progress, but these alone could not maintain the new order apart from the physical basis built by science, itself a psychic factor. Were this support withdrawn, it would seem that over large areas now occupied by civilization, society must lapse and break into fragments fast degenerating into the state of the villages of the Russian plain, the scattered communities of the southern Appalachians or even to the pueblos of Arizona.

As we have spoken of the service of science in promoting the physical well-being of society, there remain of Professor Giddings's notes of social progress only the evolution of rational conduct and the consciousness of kind. These phenomena are involved in the evolution of the social mind. Here science acts directly and also by the reflex of the social organism. The organic unity of society is the ground for the expansion of the consciousness of kind. The social ties woven by science help to produce a wider social sympathy. Under the régime of science the barriers of the mark break down everywhere to make way for the market, and with their downfall the provincialism, indifference and hate of once separated peoples pass away. Science has created, as we have seen, a new physical en-

vironment which reacts constantly on the social mind, awakening from torpor, stimulating to greater activity, demanding a more alert attention, and a precision and swiftness of movement before unknown.

Still more directly is science creating an intellectual milieu whose influence on the social mind is as inescapable as is that of climate on the physical life. The world of our forefathers, how close its confines, how dark and shadowy, how uncertain and untrue, compared with the illimitable sphere which science now fills with her clear light. It is a universe, not a multiverse, the new world which science apperceives. It is a world of law, in which each event has adequate cause; the expression of one immanent energy operating across all widths of space and throughout all lengths of time, without loss or increment, and without variableness or shadow of turning; an eternal becoming an evolving order which comprehends the growth and decay alike of solar systems and of the humblest of living creatures. It is of this new world that the two master Victorian poets, inspired by both the scientific and the religious spirit, have written:

All's law, but all's love.

and,

One God, one law, one element,
And one far off divine event
To which the whole creation moves.

The effect of these new cosmic conceptions of science penetrates every department of learning and every field of life. It revolutionizes society. It rationalizes the social mind. It has swept to the limbo of things that are not the sprites of evil which affrighted our forefathers. In this science has done a work which neither literature nor art nor religion nor ethical culture has proved itself able to accomplish. It was the pious Melancthon, the gentle scholar of the Reformation, who at Heidelberg saw in falling stars only the paths of

deceitful devils, and the mandarin to-day, learned in all the ethical wisdom of Confucius, a classical scholar of the finest literary taste, still burns his firecrackers at the funeral of a friend that he may frighten away the pestiferous spirits of evil which dog the steps of men through life even to the threshold of the world beyond.

The rationalizing influence of science upon civilization needs no illustration to one versed in the literatures of the prescientific ages, to one who has read Plato's 'Timæus' or Plutarch's description of the moon. And how preposterous were the theories current but a century since, such as those which saw in fossils the freak of some plastic power in nature or the remains of a catastrophe which swept away in a flood of waters the very foundations of the earth. To-day how rare and how interesting are such survivals of this almost forgotten time as the Atlantis of Ignatius Donnelly!

The theory of evolution furnishes one of the best examples of the replacement of the untruths of the past by truths discovered by science, and of their revolutionary effect. Since the discovery of the proofs of this process, man has come to know himself as never before. He understands at last the meaning of history and rewrites his texts on philology, literature and all social and political institutions. He sees, though as yet dimly, some solution to the ethical problems of sin and evil, and beholds as in a panorama the process of his creation.

It is as yet too soon to see the full effect of these new conceptions upon the social mind. Science has not yet come to its own in education, and the irrational and the unreal are far from being wholly banished from society. But more and more the care of the young is entrusted to science to train, as none other can, to be quick of eye, true of speech, and rational in thought, to bring them face to face with reality and to open

to their view the widest and most inspiring vistas. Common knowledge is one of the strongest social bonds. We meet and touch in what we know. The time has been when educated men drew together in a common knowledge of phrases written in extinct languages. To-day they find this rapprochement, this consciousness of kind, more and more in a common training in science. In the laboratory they have measured the energy of the falling body and studied its transformation into sound, heat, light, chemism and electricity; they have tested the ray from the hydrogen atom and found its vibration the same from the flame on the table and in the light of Sirius. They have dissected the tissues of life, and have read in Nature's book the life histories of mountain, river and planet. And thus to-day they have attained to that cosmic conception, overwhelming in its sublimity, which is the best gift of science to man.

The reward which science asks for this service is the wages of going on; she asks for well-equipped laboratories, for longer courses of scientific study in schools, for the endowment of scientific instruction and research. Such foundations as the Lawrence Scientific School, the Field Columbian Museum, and the Smithsonian Institution are examples of appreciation as yet as rare as munificent. I am not aware of any such in Iowa. When wealth builds the spacious laboratory or endows a chair in science in any college of the commonwealth, it is but rendering to science her own. Each dollar earned by railway, telegraph and telephone, mine and quarry, mill and factory, farm and store, may well pay tithe to science which has made these industries possible. The gratitude for a life saved by the applications of science in modern medicine might well be generous. And yet the total gifts to scientific instruction in Iowa by men of wealth do not exceed \$50,000. I am aware of the State appropriations to the

scientific departments in our State institutions, and I should be glad to call them generous. At least they have given Iowa the fame of men whose work in science has achieved national recognition. But these yearly appropriations, were they many times as great, could not supply the place of the great gifts, endowments to be for all time reservoirs of power transmuted constantly into the highest social service. It is the boast of American democracy that by such votive offerings it shows appreciation of education, charity and scientific research.

As members of a guild of workers in science, let us be thankful for even the humblest place. To discover any fact, however trivial, to add anything, however slight, to the sum of human knowledge, this is to shape and dress some stone for the building of science, the home and shelter of the race. Our contribution may go to chink some crevice, or at least some master builder may find in it the keystone of an arch or the cap stone of a column. But whatever its place, if our work was well and truly done it abides as a permanent service to society.

WILLIAM HARMON NORTON.

CORNELL COLLEGE, MT. VERNON, IA.

A NEW CONNECTION BETWEEN THE GRAVITY MEASURES OF EUROPE AND OF THE UNITED STATES.

ABSOLUTE measures of gravity, repeated by different observers using different instruments at identical stations, have shown comparatively large disagreements. The general experience has been that differential measures of gravity are much more accurate than absolute measures, and there has, therefore, been a growing tendency to use the differential method rather than the absolute method. The results of such differential measures may be reduced to absolute units either by connecting by the

relative measures many stations at which absolute measures have been made and then making an adjustment to get a mean value, or a single determination of the absolute value of gravity, which is believed to be of a much higher degree of accuracy than any other, may be used in reduction to absolute units.

These general conditions, especially with respect to gravity stations in Europe and the United States, led naturally to the campaign of differential gravity measures carried out by Assistant G. R. Putnam, of the Coast and Geodetic Survey, in the summer of 1900, under the direction of the International Geodetic Association.

The compact and portable half-second differential pendulums known as A4, A5 and A6, and of the type developed under the direction of Dr. T. C. Mendenhall while he was superintendent of the Coast and Geodetic Survey, were swung at Washington in May and again in October, 1900. Between these dates they were also swung at the Kew University, Greenwich Observatory, London Polytechnic Institute, Paris Observatory and at Potsdam, Germany, and thus served to determine with considerable accuracy the relative values of gravity at these points. Some of the principal previous determinations of gravity which have been made at or near these stations, and are therefore connected by the observations of 1900, are at Washington, by Preston in 1889-90, and Defforges in 1893; at the Kew Observatory, by Heaviside in 1873-74, by Herschel in 1881-82, by Walker in 1888, by Von Sterneck in 1893; at Greenwich Observatory, by Von Sterneck in 1893; at the London Polytechnic Institute, by Sabine, Kater and Herschel; at the Paris Observatory, by Defforges in 1892, and Von Sterneck in 1893. At Potsdam the observations connect with a most elaborate and painstaking determination of the absolute value of gravity which is now in

progress under the direction of the International Geodetic Association, and which is expected to yield the most reliable value ever yet determined in absolute units.

Other connections of varying degrees of accuracy had previously existed between these six stations. The new measures furnish direct connections of a very high degree of accuracy. These six stations have directly or indirectly been connected by various observations with nearly all the gravity stations of the world.

The work of deducing from the numerous connections between the gravity measures of various countries the best absolute values of gravity at the many points of observation scattered over the whole globe is peculiarly the duty of the International Geodetic Association, and is being performed systematically by that organization. In this investigation the gravity observations of 1900 furnish important new evidence.

The special value of these gravity measures of 1900 to the Coast and Geodetic Survey lies in the fact that they furnish the means of reducing accurately to absolute units all the relative measures made in the United States with the half-second pendulums during recent years. These values have up to the present time been reduced approximately to absolute units by assuming that the value of gravity at the Coast and Geodetic Survey Office is 980.098 dynes. This approximate value was adopted in 1892 and depends upon an absolute determination of gravity at Hoboken, N. J., and three comparisons of Hoboken with Washington by relative measures with three different sets of pendulums, and finally an absolute determination at Washington in 1889-90. In 1894 Mr. Putnam derived twenty-nine different values for gravity at Washington by utilizing all the connections available at that time between Washington and various stations at which absolute

measures had been made by various observers from 1792 to date. The mean of these values was 980.107. As the individual determinations showed a wide range, 0.147, the value 980.098 cited above was retained. From the relative observations of 1900, combined with the preliminary published absolute value of gravity at Potsdam from the observations which are still in progress, the value of gravity at Washington is 980.111. This differs by one part in 77,000 from the approximate value adopted in 1892, and by only one part in 250,000 from the mean of the 29 values deduced in 1894.

JOHN F. HAYFORD.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

THE first conversazione of the Institute was held at Columbia University on the evening of April 12th. About 1,500 ladies and gentlemen attended and enjoyed a most pleasing entertainment. Through the courtesy of the University authorities every facility in the way of space, current supply and assistance in preparing exhibits was placed at the disposal of the exhibitors, so that the many new devices, etc., were shown in actual operation. The list of exhibitors was long and the character of the apparatus extremely varied, as might be expected from a function held under the auspices of a society which represents the connecting link between pure science and commercial engineering. Many of the names included are well known in scientific circles, but the exhibits were in every case novel and have created a standard which will tax the energies of the Institute to the utmost to repeat in future conversazioni. Many notable persons were present as guests of the Institute, among them President Low and numerous professors of Columbia. President Low was accompanied by Baron von Holleben the German Ambassador to this

country. Mr. Thomas A. Edison was among the distinguished electricians present, while a great number of colleges were represented by exhibitors and guests, Vassar sending a contingent of a dozen students interested in natural science.

Dr. Michael I. Pupin exhibited the original apparatus used in developing the recent invention for the improvement of long-distance land and ocean telephony which has recently been bought by the American Telephone Company. Mr. Peter Cooper Hewitt showed numerous samples of his recently invented high efficiency lamps. In these lamps mercury vapor is used instead of a filament, the lamp consisting of a long, cylindrical glass tube. At the bottom of each is some mercury, from which, when the current of electricity has passed through it, issues the vapor and a most peculiar colored light is emitted. It is half purple, half green. This is a disadvantage, but it can be obviated by the use of counteracting colored shades. In a room near the Hewitt lights were the akouphone and akoulalion invented by Mr. M. R. Hutchison. They are microtelephonic instruments, so constructed as to reproduce and intensify sounds and still preserve their quality, and many successful experiments were made upon deaf mutes, in which they were taught many new words during the evening. One of the largest lecture rooms of the university had been set aside for the use of Mr. Nicola Tesla, where he showed numerous interesting experiments with high-frequency currents.

Much interest was shown in the exhibit of European Nernst lamps, made by Mr. William J. Hammer, who also showed Weldemar Paulsen's new telephonograph and telegraphone, loaned by Lemvig Fog and Emil S. Hagemann of Copenhagen, Denmark.

These instruments receive telephone messages in the absence of the recipient and

record them on a kind of magnetic phonograph, which repeats them when the one for whom they are intended returns.

Another exhibit of Mr. Hammer's was a collection of aeronautical pictures, comprising photographs of Professor S. P. Langley's *aërodrome*, Sir Hiram S. Maxim's flying machine, Santos-Dumont's dirigible airship, and Count Zeppelin's balloon; together with the balloon tests made during the Aeronautical Congress, at the Paris Exposition of 1900, and by the Aéro Club of France. Most of these photographs were taken by the exhibitor. Prof. S. P. Langley exhibited his latest form of bolometer for spectrum analysis and showed many drawings and diagrams of the principles and results obtained.

Professor W. S. Franklin exhibited a magnesia arc lamp, an electrolytic lamp on the Nernst principle, operating on 1,000 volts.

Professor Francis C. Crocker showed magnetic liquids, with apparatus in operation for showing the magnetic properties of liquids and for measuring their permeability, and Mr. Martin P. Rice, a new X-ray apparatus employing a modified form of Wehnelt interrupter. Radiographing of alternating currents was shown in a large room which could be darkened at will. The exhibitors were Professor Harris J. Ryan and Professor J. O. Phelon, and their method secured stationary and continuous diagrams of alternating current values by records made from the radiographs of a rapidly rotating cathode ray, the rotation being caused by the action of the current.

Professor Elihu Thomson had a most interesting exhibit consisting of a dynamo static machine and a new rotary electrical apparatus. The former contained a small direct-current motor, the windings of which were tapped and connected to two rings, giving a primary alternating current for the operation of a step-up transformer which gave a secondary current of about 20,000

volts, being capable, however, of regulation through a wide range. The tops of the alternating current waves of high potential obtained from this secondary transformer were used to charge a number of glass plate condensers in parallel. The rotating frame synchronously driven with the motor made the connection to the condensers periodically and in synchronism with the alternating current. The connection by the rotating frame is alternately in parallel and in series, the condenser plates being charged to 15,000 volts with ten in parallel, giving 150,000 volts when connected in series. The machine therefore furnishes from low pressure direct current, high potential discharges of definite polarity at the discharged terminals. The new rotary electrical apparatus consisted of an iron sphere heavily electroplated with copper and mounted so that it may revolve on any axis or in any plane. Surrounding this sphere were three coils in planes at right angles to each other. By suitably energizing these coils with polyphase current the sphere was made to revolve on any axis or in any direction, thus illustrating a three dimension polyphase system. This apparatus shows in a very satisfactory manner the principles of the gyroscope and Bohnenberger sphere.

Professor Thomson also exhibited an aluminum disc mounted on a shaft free to rotate, and having applied to it in special ways alternating current magnetic fields, the rotations of the disc involving interesting paradoxes which the visitors were asked to explain.

Mr. E. V. Baillard showed the Parker-Baillard bridge for measuring low electrical resistances for general work and standardization and an ingenious faradmeter for the direct measurement of capacity. Some interesting spark experiments, showing oscillating discharges occurring rapidly during the same half wave, and proving that a short circuit in a high potential current containing

inductances and capacity ruptures itself instantly, were shown by Mr. W. S. Andrews who also exhibited a luminous aluminum cell giving beautiful effects.

Among the many other exhibits were various forms of storage batteries by Mr. Elmer A. Sperry, Mr. Herbert Lloyd, Mr. A. S. Hubbard and Messrs. Frank Perret, J. A. Barrett, and W. H. Meadowcroft. Mr. H. R. Palmer showed a fac-simile picture telegraph in operation, Mr. Otto T. Louis an electric furnace and an ohmmeter. A specimen of the standard United States Army field telephone and telegraph kit used in the Cuban and Philippine campaigns, and wireless telegraphy as improved by the Government, were in charge of Col. Samuel Reber, U. S. A.

W. C. ANDREWS.

SCIENTIFIC BOOKS.

Erinnerungen aus meinem Leben. Von A. KÖLLIKER. Leipzig. 1899. 8vo. Pp. x + 399.

This work of the veteran celebrated histologist is much more than an autobiography, since it includes a number of original contributions to science, with which the anatomist and embryologist must necessarily acquaint themselves.

The first part is strictly biographical, giving a general account of the author's life, which passed without exciting elements along academic paths. Kölliker was born at Zürich, in Switzerland, on July 6, 1817, the elder of two children. He dwells somewhat upon the recollections of his boyhood, recalling with pleasure a few boyish escapades. He early displayed great fondness for nature; he loved the mountains and made collections of plants and minerals, and therefore was led naturally to the study of medicine. But practice had no allurements for him, especially since he soon fell under the spell of the microscope, as a revealing instrument, in the employment of which he has spent his long life. In the summer of 1839 he went to Bonn, hearing there medical lectures in Latin, and the autumn of the same year he passed to Berlin and came under the

direct influence of Germany's greatest morphologist, Johannes Müller, and of Jacob Henle. The latter brought him to the study of the microscopic anatomy of the human body, and so started him upon the career of investigations, which, sixty-two years later, he is still pursuing. It is an interesting coincidence that Kölliker's career began in 1839, the very year in which Schwann established the cell doctrine for animals, so that he has lived through the whole period of the application of that doctrine to the problems of morphology, physiology and pathology, and has, during this epoch, achieved the remarkable distinction of having contributed more than any other single investigator to our knowledge of the cellular structure of animals. It is difficult to realize how many of the fundamental facts of microscopic anatomy, even of those which have been taught in elementary text-books for forty or fifty years, we owe to the discoveries of Kölliker.

In 1841, he became assistant to Henle, who was then at Zürich. In 1844 he was promoted to be professor extraordinarius of physiology. The conditions at Zürich were unsatisfactory, so that in 1847 he accepted a call to Würzburg, where he has since remained, for over half a century. In 1848 he married Maria Schwarz, of Mellingen, in Switzerland.

The volume gives a list of the celebrations in which the author took part, and a list also of all the medals, prizes and other honors which have been bestowed upon him. There are also accounts of his journeys, several of which took him to the sea-shore for purposes of research. The accounts are chiefly in the form of letters, written at the time, and they include a great number of interesting impressions of famous scientific men which offer valuable material for the history of science during the century.

There are three portraits of the author—that which forms the frontispiece is an admirable likeness of the handsome and intellectual face. Another full-page illustration is a photograph of the carved box which was made for the congratulatory address presented to Kölliker on his eightieth birthday.

The second part of the work enumerates his activities as a university teacher and adminis-

trator, including the various courses of lectures he has delivered. Next follows the annotated catalogue of his publications, classified with considerable care. The annotations are often explanatory of the origin and purposes of the separate publications and of the standpoint of the author at the time. Other notes define the share of an essay in developing and fixing scientific conclusions. Finally one encounters, apropos of several articles in the catalogue, additional new observations recorded, which serve to correct and amplify the original record. Some of these observations are illustrated by new figures also. In brief, there is scientific matter included, which is here published for the first time.

Kölliker's 'Erinnerungen' is different in many respects from the usual autobiography, but is certainly a remarkable contribution to the record of the general condition and progress of science during the second half of last century.

CHARLES S. MINOT.

The Bird Book. By FANNIE HARDY ECKSTORM.

Boston: D. C. Heath & Co. 1901. 12mo. Pp. xii + 276; 24 pls., map, and 31 figs. in text.

The Woodpeckers. By FANNIE HARDY ECKSTORM. With Illustrations. Boston and New York: Houghton, Mifflin & Co. 1901. 12mo., pp. viii + 132; 5 col. pls., 21 figs. in text.

The time was, not many decades ago, when the young student of ornithology was, of necessity, self-taught, learning almost wholly by his own unaided observation in the field. Nowadays the demands of a multitude of would-be learners for short and easy paths to knowledge have led to the making of many books, that serve, at least, to show how hard it is for books alone to give the beginner the training he needs. How to observe carefully and thoroughly, and how to interpret what one sees, are not readily learned, except by the hard school of experience.

In these two volumes Mrs. Eckstorm has to a remarkable degree succeeded, where some of her predecessors have failed, and surely has gone far toward accomplishing the seemingly impossible. Even abstruse technicalities and fundamental biological principles are stated so clearly and simply that a child easily may com-

prehend them; and the details of bird life are so told that the reader cannot fail to gain an idea of what things the experienced naturalist looks for, and what he sees.

'The Bird Book' is divided into four parts. A dozen or so descriptive sketches under the title 'Water-birds in their Homes,' are followed by explanations of such matters as the structure, mechanism and use of birds' feet, wings and bills, and the adaptation of their different forms to habits. Then other, more philosophical subjects are unfolded, and made surprisingly plain, such as the principles of classification, the conditions of the struggle for existence, distribution and migration; and the concluding chapters are devoted to detailed accounts of some habits of birds, as 'How the Hawk Eats his Food,' 'The Cave Swallow's Changes in Nest-building,' 'How the Shrike Hunts.'

'The Woodpeckers' is, in form, more a popular monograph of that group of birds. After several chapters on the habits of woodpeckers in general, five widely distributed and representative North American species are taken up in turn, and the characteristics of each discussed. Following this, the peculiarities and uses of the woodpecker's bill, foot, tail and tongue are studied, and then attention is drawn to the modifications of these organs in different genera and to their remarkable adaptation to the specialized habits of each. The volume is concluded by a key for the identification of all the North American woodpeckers.

The books are well written. The style is never dull, and often brilliant. They are abundantly and, on the whole, well, illustrated; and 'The Woodpeckers,' in addition to various figures in the text, contains five colored plates.

It should be added that throughout both volumes the author is remarkably successful in carrying out their evident underlying purpose—not merely to convey information and inspire interest, but to cultivate in the beginner, by example rather than precept, a truly scientific spirit, both in his observations and in his deductions.

C. F. B.

Engineering Chemistry, a Manual of Quantitative Chemical Analysis for the Use of Students, Chem-

ists and Engineers. By THOMAS B. STILLMAN. Second edition. Easton, Pa., The Chemical Publishing Co. Pp. 22 + 503. Price, \$4.50.

The first edition of this book appeared in 1897. Its usefulness is indicated by the fact that a second edition is required so soon. The work seems to be designed to serve several purposes. The first portion, especially, appears to be intended for the use of students beginning the subject of quantitative analysis. The exercises selected in this portion are satisfactory, but the directions lack that careful detail in regard to methods of manipulation and in regard to the properties of the compounds used in analysis, which are so necessary for the student who is to acquire any adequate knowledge of the subject. It may be objected, of course, that room could not be found in this book for such details. It would seem, however, that these exercises at the beginning should have been omitted altogether or they should have been properly given.

The chemist or student who has already acquired a knowledge of analytical methods will find very much throughout the book that will prove very useful. The subjects discussed cover a wide range, the more important being the analysis and filtration of water, the analysis of coal, gas and other fuels, calorimetry, iron and steel analysis, blast furnace charges, analysis and tests of cements, analysis of clay, alloys, paper, soap, oils, paints and asphalt, pyrometry, electrical units and energy equivalents.

The writer is well aware of the large amount of labor which an author must give to the study of the literature of each topic in writing a book of this kind, in order to determine what is the best present analytical practice, and some mistakes are to be expected. In several cases, however, it would seem that better methods or more accurate directions might have been easily found. Thus, under coal analysis, in giving Eschka's method for sulphur, nothing is said about the danger of absorption of sulphur from an ordinary gas flame; for phosphorus in steel the method of Dudley and Pease is given, although that method has since been modified in several important particulars, and made more accurate without increasing the time required for its execution; for total carbon in iron, solu-

tion with the use of neutral copper sulphate is recommended instead of the acid solution of the double chloride of potassium and copper, which has been shown to be more exact by the American Committee on Standard Methods.

With revised tables of atomic weights, published annually by both the American and German Chemical Societies, it seems hard to find an excuse for a list which includes such values as Al, 27.5; Mg, 24.0; Si, 28.0; Cr, 52.5; Zn, 65.0. Antiquated values are also given for the specific gravity and weight of one liter of hydrogen.

While defects in the book have been pointed out at some length, it would be unfair not to refer to the large amount of valuable material to be found in its pages.

The frequent tables of analysis for commercial products give, in concise form, directions which will be very useful to the working chemist. The specifications for many substances used by railroad companies form a unique and excellent feature. And, while pyrometry, electrical units and energy equivalents do not properly belong in the domain of chemistry, many chemists will find them useful.

W. A. NOYES.

Ausgewählte Methoden der analytischen Chemie.

Von PROFESSOR DR. A. CLASSEN. Erster Band unter Mitwirkung von H. Cloeren. Braunschweig, Friedrich Vieweg und Sohn. 1900. 18mo. Pp. xx + 940. Figs. 78. Price, M. 20.

Notwithstanding the astonishing number of books bearing upon analytical chemistry which appear yearly, it is probably within bounds to say that, until recently, only those of Fresenius, Böckmann, Bolley, Post, and possibly that of Crookes, have generally been regarded as fulfilling the requirements as to scope and reliability of a satisfactory book of general reference. In the last few months, however, three works of wide range and excellent promise have appeared—namely, those of Carnot (*Traité d'analyse des substances minérales*), Lunge (*Chemisch-technische Untersuchungs-methode*) and this work of Classen. Classen's work differs, however, from those of Lunge (a continuation of that of Böckmann), Bolley, and Post,

in that he presents his subject matter in such a way as to emphasize rather the general usefulness of the methods described than to present schemes for the analysis of particular bodies, although the application of the methods to special cases is adequately treated. On the other hand, Classen's work differs from those of Fresenius and Carnot, in that he has prepared the book for the use of technical chemists and advanced students to whom the general operations of analytical chemistry, such as weighing, filtering, and the like, are known. These are, therefore, omitted, and he proceeds at once to the description of particular methods.

The present volume includes only the metals and metalloids. Methods suitable for the qualitative detection of each are described, followed by procedures for their quantitative determination by volumetric, gravimetric, colorimetric or electrolytic methods, the selection having been determined upon, he states, only after tests made by him, his assistants or pupils, or, in some instances, after he had become convinced of the accuracy of the processes through published criticism. The descriptions of the procedures for the determination of the metals are, in turn, followed by those of methods for such separations from other elements as occur in ordinary analytical practice, and, in addition to the foregoing, special schemes are given for the analysis of bodies of technical importance, such as irons and steels, aluminum and its alloys, cements, clays, glasses, zinc ores and zinc dust, chrome iron ore and chrome steel, uranium ores, platinum ores and residues, 'osmiridium,' 'platiniridium,' fertilizers, liquid ammonia, ammoniacal liquors, and a scheme for rock analysis.

The value of this book as a work of reference is also much enhanced by the introduction of matter relating to the rarer elements. The methods described for the separation of the rare earths by fractional precipitation and the analysis of monazite sand, as well as of the materials employed in the manufacture of mantles for incandescent lamps, appear to be specially complete.

The author deplores the general absence in text-books and journals of statements indicating the basis of the stoichiometrical calcula-

tions often required in connection with the analytical operations described, and has, wherever these calculations are at all complicated, indicated the method of procedure. Tables to assist in the calculation of analyses are also appended.

References to the original sources of information are uniformly and freely given. Many of these refer to articles published in 1900, indicating that the book has been brought well up to date. The book closes with an excellent subject and author index, and the typography throughout is very satisfactory.

Professor Classen presents, as a product of thirty years of analytical practice in connection with technical chemistry, a work which bears evidence of a high degree of trustworthiness and is, to the extent to which it has been finished, of an unusual degree of completeness. As would have been expected, considerable stress is placed upon electrolytic methods and their advantages, and the omission of certain methods which are known to be reliable may cause some surprise; but there can be no doubt that the work is a distinctly valuable addition to the literature of analytical chemistry, and is sure to be of great service. Its early completion is much to be desired.

H. P. TALBOT.

SCIENTIFIC JOURNALS AND ARTICLES.

IN the February-March number of the *Journal of Geology* Thomas L. Watson discusses 'The Origin of the Phenocrysts in the Porphyritic Granites of Georgia.' Detailed descriptions of the rocks of various districts are given. The criteria for distinguishing phenocrysts formed *in place* from those of intratelluric origin are stated and the conclusion is drawn that these were undoubtedly formed in place. Under the title of 'Certain Peculiar Eskers and Esker Lakes of Northeastern Indiana,' Charles R. Dryer describes some interesting results of deposition by glaciers or glacial waters which he does not attempt to fully explain. Good contour maps are given which, with the data furnished, will bear study. 'Correlation of the Kinderhook Formations of Southwest Missouri' is discussed by Stuart Weller. A recent State report makes a part of

these rocks Devonian and supposes the section to be poor in fossils. Mr. Weller has collected many fossils from the area and gives in detail the evidence upon which he definitely correlates all the beds with the Chouteau limestone of central Missouri which is Upper Kinderhook. F. W. Sardeson concludes the discussion of 'The Problem of the Monticuliporoidea' begun in the last number. O. C. Farrington contributes a second article on 'The Structure of Meteorites,' giving a detailed description of the chondritic structure. An interesting conclusion gives an account of the synthetic experiments by which it has been attempted to reproduce the structural details of meteorites. Success in this line has not been marked, and it may be necessary to fall back upon extra-terrestrial conditions. The intense cold of space is suggested.

IN *The Auk* for April P. B. Peabody describes the 'Nesting Habits of Leconte's Sparrow,' and William Brewster notes 'The Occurrence, in Massachusetts, of Certain Rare or Interesting Birds,' and Frank Coates Kirkwood tells of 'The Cerulean Warbler (*Dendroica caerulescens*) as a Summer Resident in Baltimore County, Maryland.' Joseph Grinnell describes 'Two Races of the Varied Thrush' and J. Lewis Bonhote has some notes 'On a Collection of Birds made by Mr. T. R. Thompson at the Cay Lobos Lighthouse, Bahamas'; and Otto Widmann contributes an article on 'A Visit to Audubon's Birthplace,' Fontainebleau Plantation, near Mandeville, La.; the house is now in ruins. Reginald Heber Howe, Jr., has 'A Study of the Genus *Macrorhampus*' deciding that *M. scolopaceus* is but a subspecies of *M. griseus*. H. W. Henshaw notices 'Birds of Prey as Ocean Waifs,' and Francis J. Birtwell gives 'A Description of a Supposed New Subspecies of *Parus* from Mexico.' Hubert Lyman Clark discusses 'The Pterylosis of *Podargus*, with Notes on the Pterylography of the Caprimulgi,' concluding that the nearest relatives of this group of birds are to be sought for among the nocturnal birds of prey. There is a 'Republication of Descriptions of New Species and Subspecies of North American Birds, No. II.' by J. A. Allen, Wilfred H. Osgood describes

'New Subspecies of North American Birds,' and Leonhard Stejneger considers 'The Two Races of *Saxicola oenanthe*.' There is a large number of interesting General Notes, reviews of Recent Literature and Notes and News.

Bird Lore for March-April opens with an article by Frederic A. Lucas on 'Walrus Island, a Bird Metropolis of Bering Sea,' with some reproductions of fine photographs by H. D. Chichester. Mrs. Harriet Carpenter Thayer tells of 'Our Blue Jay Neighbors,' with illustrations from photographs by Thos. S. Roberts; F. A. Van Sant has a brief paper on 'Early Larks,' and P. B. Peabody another on 'Saw-whet Homes.' In the third series of 'Birds and Seasons' the theme is treated by various well-known ornithologists, the birds being those for April and May. Elizabeth Hoppin Lewis contributes for young observers an illustrated poetical 'A B C of Bird-Lore.' There are the usual reviews and the section devoted to the 'Audubon Societies.'

THE *Journal of the Boston Society of Medical Sciences* for February contains papers on 'The Relation Between Conductivity and the Inorganic Salts of the Nerve,' by Albert P. Mathews; 'Dermatomyosites, with Report of a Case which also presented a Rare Muscle Anomaly, but once described in Man,' by Walter R. Steiner, and 'The Effect of Carbon Dioxide and Oxygen on Smooth Muscle,' by Allen Cleghorn, assisted by H. D. Lloyd. The remainder of the number is devoted to abstracts of papers presented at the second annual meeting of the Association of American Bacteriologists, in December, 1900. Among these we note one on the possibility of infection from the use of modeling clay in school work.

SOCIETIES AND ACADEMIES.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY OF THE NEW YORK ACADEMY OF SCIENCES.

A REGULAR meeting of the section was held on March 25th, Professor Cattell presiding. The annual election of section officers was held, resulting in the choice of Professor Livingston Farrand as Chairman, and Dr. R. S. Woodworth as Secretary.

Professor F. H. Giddings presented a paper on the use of the term 'race.' He spoke in part as follows: "The term 'race' as used by many different groups of investigators—anthropologists, ethnologists, philologists and historians—long since ceased to have a definite meaning. Efforts to establish a technical and conventional use of the word have thus far been unsuccessful. As one more attempt I suggest a combination of the word 'race' with various descriptive adjectives, denoting successive degrees of kinship. The narrowest degree of relationship is consanguinity, or the relationship (physiological, psychological and sociological) of father, and mother and children, brothers and sisters, grandparents and grandchildren, uncles, aunts and cousins. Let us designate this degree of kinship by K_1 . The next degree of kinship, or K_2 is propinquity. The primary meaning of this word is 'nearness in place' and the secondary meaning is 'nearness in blood.' The word is thus perfectly descriptive of a state of facts which we find when a number of families live in the same neighborhood and, through intermarriage and association, become related (but less closely than the consanguinity of K_1) in blood, in type of mind, and in institutions. K_3 is nationality, that wide degree of kinship (physical, mental and social) which includes those who speak the same language, and, for many generations, have dwelt together under the same political organization. K_4 is potential nationality, or the degree of relationship (physical, mental and social) of a heterogeneous people composed of many nationalities, undergoing assimilation, or blending, into a new nationality, as in the United States. Potential nationality includes the familiar census divisions, 'native born of native parents,' 'native born of foreign parents,' and 'foreign born.' K_5 is ethnic-race, a group of closely related nationalities, speaking closely related languages, and having well-marked psychological characteristics in common. Examples are the Celtic ethnic-race, including the Welsh, the Irish, the Highland Scotch, some of the Cornish and the Bretons; the Teutonic ethnic-race, including Germans, Swedes, Norwegians, Danes and Dutch; and the Latin ethnic-race, including Italians, Spaniards and Greeks; K_6 is Glot-

tic race. This is that very broad relationship, to a slight extent physical, to a somewhat greater extent mental and social, of those related ethnic-races that speak languages derived from a common ancient tongue. Examples are, the Aryan glottic-race, including the Celtic, Teutonic, Latin and other ethnic-races; the Semitic glottic-race, and the Hamitic glottic-race. K_7 is chromatic race, that extremely wide and vague relationship, which includes related glottic-races marked by the same color. Examples are, the white chromatic-race, which includes the Aryan, Semitic and Hamitic glottic-races; the yellow chromatic-race, which includes the various glottic-races known as Mongolian or Turanian; the brown, the red and the black chromatic-races. K_8 is cephalic-race, or that widest relationship which includes chromatic-races of like cephalic index. The distinction about which I feel most doubt is this between chromatic and cephalic race. Remembering that, according to this scheme, variability and multiplicity of specific characteristics produced by differentiation should increase as we proceed backward from K_8 to K_1 , I think that probably cephalic index is rightly placed as K_8 and color as K_7 because, in the organic world in general, coloring seems to be a less stable characteristic than anatomical structure. The compound terms which I have here introduced are admittedly clumsy, but they have the advantage of conveying precise meanings. If a writer speaks of 'race' without a qualifying word, his reader must guess at his meaning. If he says, 'cephalic-race,' 'chromatic-race,' 'glottic-race,' the meaning cannot be mistaken."

In reply to a question Professor Giddings said that the clan is developed between K_1 and K_2 and the tribe between K_2 and K_3 .

The following paper was read by Mr. Stansbury Hagar, on the 'Wards of Cuzco.' The speaker presented a portion of the evidence collected by him which tends to show that the twelve so-called wards of Cuzco, the ancient capital of the Inca Empire, were the terrestrial representatives of the signs of the Peruvian zodiac. The evidence bearing on this hypothesis is divided into four main classes. In the

first place, the system of 'mamas,' under which the Peruvians regarded every material object as merely a product of the real spiritual essence of which it was the expression, gave rise to an attempt to imitate on earth the features of the world above as observed in the heavens. This system, in turn, resulted in the production of an elaborate ritual, the features of which, each month, corresponded with the supposed attributes of the 'mama' which governed the corresponding sign through which the sun was passing during that month. The ideas associated with the 'mamas' are shown to correspond with the names of the Cuzco wards. Again, these names correspond very definitely with the names of the zodiacal signs upon the native star map of Salcamayhua. And finally the names of one or two of the wards can be identified directly with definitely known native constellations situated in the zodiac. The nature of the evidence thus adduced is such as to indicate that the native Peruvians had made remarkable advance in astronomical knowledge in times long anterior to the arrival of the earliest Europeans known to history.

R. S. WOODWORTH,
Secretary.

GEOLOGICAL SOCIETY OF WASHINGTON.

At the 113th meeting, held at the Cosmos Club March 27, 1901, the discussion of geological units begun at the preceding meeting was continued by Professors H. S. Williams, C. R. Van Hise, T. C. Chamberlin, and others.

At the 114th meeting, held April 3d, the following communications were presented:

The Priceite of Lone Ranch, Curry Co., Oregon:
J. S. DILLER.

This chalky borate of lime occurs rather irregularly upon and in a mass of serpentine, and is probably a hot-spring deposit.

The Problem of the Archæan: C. R. VAN HISE.

An historical review of the progress made in differentiating pre-Cambrian rocks, and a statement of the present basis of distinction between Archæan and Algonkian.

At the 115th meeting, held April 10, 1901, the program was as follows:

The Philadelphia Gneisses: F. BASCOM.

A study of the petrography, structure, age and genesis of the gneisses in the vicinity of Philadelphia.

Possible Pre-Wisconsin Till of Massachusetts: MYRON L. FULLER.

In the central portion of this country, the deposits of till have been differentiated into sheets of different ages, but in New England the severe glaciation of the Wisconsin Period removed, as a rule, all traces of earlier tills. Recently, however, a number of exposures have been discovered in the region south of Boston in which highly oxidized or disintegrated tills are found to underlie the ordinary light buff till of the Wisconsin ice invasion.

This lower till contains from two to four times the amount of clay contained by the Wisconsin till, is composed almost entirely of deeply decayed or disintegrated materials, is marked by the presence of the bright colors characteristic of advanced oxidation, lies upon deeply altered and practically unglaciated rock surfaces, has no far-traveled rock fragments, and is sharply separated from the overlying till both by its color and by its composition.

This older till is probably to be correlated with the Kansan or pre-Kansan till of the central portion of the United States.

The Waverly Group in Northeastern Ohio: GEORGE H. Girty.

In 1900 an effort was made to trace eastward into Pennsylvania the members of Newberry's Waverly section in northern Ohio. The Berea grit of the Waverly group was found to be the equivalent of the Cussewago sandstone of northwestern Pennsylvania. The Orangeville shale of that region is the basal third of the Cuyahoga shale, in part equivalent to Orton's Berea shale. The Sharpsville sandstone representing the middle portion of the Cuyahoga is probably the stratum producing the lower falls at the village of Cuyahoga Falls. The Meadville shale can with little doubt be correlated with the upper portion of the Cuyahoga, and it seems probable that the Shenango sandstone and shale are the equivalents of the Logan group. It is doubtful if the Corry sandstone is represented in Ohio, while the Bedford and

Cleveland shales probably die out before reaching the Pennsylvania line.

F. L. RANSOME,
DAVID WHITE,
Secretaries.

CHEMICAL SOCIETY OF WASHINGTON.

THE 125th regular meeting of the Society was held March 14th. The following papers were presented:

'Notes on a New Indicator,' by E. G. Runyan. In this paper were presented results on the determination of total acidity in both white and colored wines, using as indicator an alcoholic solution of malachite green and commercial rosolic acid or corralin. For comparison, results obtained on the same samples with phenolphthalein and litmus were also presented. The data given seemed to be favorable to the use of the corralin-malachite indicator in titrating wines and similar colored products.

'The Action of Saccharin on Sugars and other Carbohydrates,' by L. M. Tolman. The author stated that saccharin was being sold as a substitute for sugar, and that it was sometimes found mixed with cane sugar. The best method of determining the saccharin present is the Reid method, by which the saccharin is hydrolized to the acid ammonium salt of sulfo-benzoic acid, and the ammonia determined by distillation. The benzol-sulfimide was found to be a strong hydrolizing agent, readily inverting cane sugar. With cane sugar the inversion was as complete as by the official method, and upon heating for a long time there was no destruction of sugar. Lactose and dextrose were not affected by the sulfimide, a fact that may be used in the determination of cane sugar in the presence of milk sugar or dextrin, or both.

'The Nature and Function of Soil Solutions,' by F. K. Cameron.

'Permanganate of Potash as a Chemical Antidote,' by V. K. Chesnut. After a critical discussion of the work of La Cerda, Antal, Schlagdenhauffen and Reeb, Moor, Wood and others, who applied dilute solutions of the permanganate as an antidote in cases of human poisoning caused by snake bites, phosphorus, oxalic and hydrocyanic acids, coronillin, morphine and various plant alkaloids, the writer gave the

results of some experiments made with the salt by Dr. E. V. Wilcox and himself in cases of the poisoning of sheep from eating plants. These experiments were made in Montana where hundreds of sheep are killed by certain poisonous plants every year. Preliminary experiments indicate that a one-per-cent. solution of KMnO_4 , to which one per cent. of the sulfate of aluminum is added, is a wholly satisfactory antidote for poisoning by two of the most poisonous groups of plants of that State, the species of death camas, *Zygadenus*, spp. and the larkspurs, providing, of course, that it be given in the earlier stages of the poisoning. The sulfate of aluminum was added because of the greater oxidizing value which it confers upon the permanganate. The use of the mixed salts in cases of poisoning by other plants is to be further investigated.

L. S. MUNSON,
Secretary.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 533d meeting was held March 30, 1901. Mr. J. B. Baylor read a paper on the 'Magnetic Survey of North Carolina,' which had been carried on jointly by the State and the U. S. Coast and Geodetic Survey. The total cost was stated to have been \$16.70 per county, including the establishment at each county seat of a meridian line. Charts of isogonic lines showed many local irregularities, and that the declination had changed several degrees within one hundred and fifty years.

Mr. J. E. Watkins, of the National Museum, gave a half-hour paper on 'A Century of Land Transportation by Steam,' narrating the development of rails, wheels and locomotives, with especial reference to early American practice.

An interesting sketch of Titian R. Peale, one of the founders of the Society, was then read by Mr. A. C. Peale. Mr. Peale was born in 1799 and died in Philadelphia, in 1885. He was assistant naturalist with Long's expedition in 1819, and naturalist to the Wilkes' expedition about 1840; he drew the illustrations for many works on natural history, and for twenty-five years was an examiner in the U. S. Patent Office.

C. K. WEAD,
Secretary.

THE 534th meeting was held April 13, 1901. The first paper upon the program was by Mr. Edwin Smith, on the 'International Geodetic Association Latitude Service.' It consisted of a short general statement of the history of the development of our knowledge of the variation of latitude up to 1898, of the plan of observations devised by the International Geodetic Association in 1898, and of the very satisfactory progress made in carrying out this program at six stations nearly upon the thirty-ninth parallel. Lantern slides were exhibited showing the distribution of the stations in longitude, various curves illustrating the latitude variation, a graphical representation of the program of observation, and the instrument and observatory at Gaithersburg, Md.

Mr. Artemas Martin read a paper on the 'Properties of Rational Plane Triangles.'

JOHN F. HAYFORD,
Secretary.

ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

THE 315th regular meeting of the Anthropological Society was held March 26th.

Mr. William Palmer demonstrated the method of making a life-mask, occupying only fifteen minutes in the operation, and without the use of quills placed in the nostrils.

Dr. I. Casanowicz exhibited Babylonian, Assyrian and Persian seals and four magic bowls from Hilleh, the bowls having inscriptions on the inside in early Aramaic and Syriac character. They are in a fine state of preservation, and the inscriptions consist of formulas for exorcism, but so far there is no clue to the method of their use. The seals shown were lately acquired by the National Museum, and among them are some of the finest examples of ancient cutting.

President W. H. Holmes exhibited several fine obsidian knives from California. One of the blades was $20\frac{1}{2}$ inches long and 5 inches wide, and with it was shown a mass of solid obsidian of the size from which such an implement could have been made. The work of manufacture must have been attended by enormous difficulties. Mr. Holmes explained briefly the process of manufacture of these remarkable specimens of stone-working.

The first stated paper was by Dr. W. W. Johnston on 'The Ill-health of Charles Darwin,' its nature, cause and its relation to his work. Dr. Johnston presented the results of an extended research into the life of Darwin, showing that up to the age of twenty-seven the philosopher was strong and vigorous; then followed thirty-six years of suffering, and eleven years of improvement to the date of his death. Dr. Johnston stated that the visible beginning of Darwin's intellectual life was during the voyage of the *Beagle*. These five years were characterized by constant strain of overwork, which was continued for several years after the voyage, though his nervous system was exhausted. The break-down of Darwin necessitated a strict regimen, the good results of which appeared in the last decade of his life. Dr. Johnston diagnoses the case as one of neurasthenia brought on by overwork, the symptoms appearing on the voyage of the *Beagle*. The prolongation of Darwin's life was due to the regimen adopted and the unremitting care given him by the members of his family. The paper was discussed by Dr. Frank Baker and Dr. Theo. N. Gill.

Dr. George M. Kober read a paper entitled 'The Progress of Charity Reform in the District of Columbia since 1896.' Dr. Kober's paper was more than locally interesting in showing what may be done by the application of rational methods to the charity problem. These are personal inspection as to the needs of applicants, stimulation to self-help by aid in securing employment, and the encouragement of small savings during times of production, to be drawn upon in times of stress. The progress noted under this system since 1896 is remarkable. Dr. Kober presented statistics showing a great diminution in applicants for aid, a heavy reduction of the expense of conducting the work, and a large increase in the number of those depositing savings.

WALTER HOUGH.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science of St. Louis on April 1, 1901, thirty-three persons present, a memorial notice of the late Judge Nathaniel Holmes, a charter member of

the Academy, was presented by a committee composed of Professor Nipher, Dr. Sander and Dr. Baumgarten.

Mr. John S. Thurman delivered an address on the many industrial uses now made of compressed air, illustrating his remarks by apparatus in operation, including electric motor air compressor, compressed air auger, drill, disinfecting atomizer, sculptors' and stone-cutters' tools, carpet renovators, etc., and a set of lantern slides showing the practical uses made of these and other implements and machines operated by means of compressed air.

Dr. Theodore Kodis exhibited, under the microscope, slides illustrating a new method of staining brain tissue, whereby, in four or five days, it has proved possible to prepare single or double stained preparations containing nerve cells with the dendrites of the latter brought out by a direct stain, instead of being differentiated merely as amorphous silhouettes, as is the case with the much slower Golgi process commonly employed. It was stated that the material is treated before sectioning, for about twenty-four hours, with cyanide of mercury, followed for approximately the same length of time by a formaldehyde solution, after which sections are cut, stained with phosphomolybdate hæmatoxylin and, if desired, a contrasting stain, such as one of the aniline greens, and mounted in the usual way.

WILLIAM TRELEASE,
Recording Secretary.

THE ELISHA MITCHELL SCIENTIFIC SOCIETY, UNIVERSITY OF NORTH CAROLINA.

THE 134th meeting of the club was held on April 9th, when the following papers were read:

'First Aid to the Injured in the United States Army': Professor C. S. Mangum.

'The Work of the Commission for the Examination of the United States Mint': President F. P. Venable.

CHAS. BASKERVILLE,
Secretary.

DISCUSSION AND CORRESPONDENCE.

OIL IN TEXAS.

TO THE EDITOR OF SCIENCE:—You doubtless have remarked that in various commercial journals the oil which flows in such

quantities from the Lucas and other wells near Beaumont, Texas, is said to come from Tertiary sands. As Geologist to the State of Louisiana I crossed over into Texas to examine the wells and their surroundings. I found them located on a slight rise of ground extending in a east-westerly direction. The length of this slight elevation is perhaps $\frac{3}{4}$ mile, width $\frac{1}{2}$ mile, and height about 25 feet above the flat surrounding prairie region. Few or no mounds were observed immediately around this rise, but upon the same they are small, but great in numbers. At the time of my visit there was but one well flowing, others not having reached the oil-bearing bed. Strict secrecy was kept as to the depth of the well. I was requested to pick up no specimens and to leave the premises. However, the shells surreptitiously obtained were sufficient to convince me that the Tertiaries were not completely penetrated; and the 'cap rock of the oil' shown in Beaumont seemed to be of decidedly Cretaceous appearance. The conclusion to be drawn was therefore that the well penetrated possibly a thousand feet of rather recent or newer Tertiary strata and then came upon some portion of a Cretaceous anticlinal fold or ridge. A statement to this effect was given to the New Orleans *Picayune*, March 27, 1901 (which see). To-day we notice that the same paper published, on April 10, a log of the Higgins well. We notice in complete corroboration of our theory the following items:

"1030 ft.—Oil-bearing sand, pebbles and sulphur.

"1040 ft.—Sulphur rock; solid.

"1045 ft.—Oil."

The well is therefore, as supposed, *i. e.*, a repetition of the 'Sulphur Mine' condition of Southwestern Louisiana, buried about twice as deeply beneath the surface by recent formations.

Through the kindness of Mr. Pattillo Higgins, a large holder in this new oil territory, we are assured of a set of samples and shells obtained from the various depths of his well. This will enable us to see just how much of the Tertiaries are missing between the Quaternary and Cretaceous oil beds.

G. D. HARRIS.

CORNELL UNIVERSITY, April 13, 1901.

DISCLAIMER NO. 2.

It is necessary that the undersigned inform the general public that the use made of their names by the 'American College of Sciences,' doing business at Philadelphia, in advertising an 'advanced course in personal magnetism, hypnotism and suggestion by seven distinguished specialists,' is wholly unauthorized and unwarranted. The public is warned against the trick of being thus led to believe that we concur in the statements made in this advertising scheme concerning the scientific facts and the practical uses of hypnotic influences. The undersigned believe that the practice of hypnotism should be restricted to a most guarded application.

Our names and the 'courses' advertised in this 'advanced course' are derived from articles which each of the undersigned was requested, individually, by the 'New York State Publishing Company,' of Rochester, N. Y., to prepare for a scientific exposition of the facts and principles of hypnotism and allied phenomena. The compilation appeared from the press late in 1900. Had the undersigned had any intimation whatsoever that this second and unauthorized use of the articles was to be made, viz., as a part of a course of instruction in the general subject, they would have absolutely refused to contribute to the compilation in the first instance. The responsibility of each of the undersigned goes no farther than the contents of the original article he contributed to the compilation.

The disclaimer is to be taken in accord with the one appearing in *SCIENCE*, November 30, 1900, p. 850, and in *The Psychological Review*, January, 1901, p. 63. The names here undersigned appear in an advertising sheet circulated by the 'College' which omits the names appearing under the first disclaimer.

Signed EDWARD FRANKLIN BUCHNER,
New York University.

A. KIRSCHMANN,
University of Toronto.

JAMES ROLAND ANGELL,
University of Chicago.

A. M. BLEILE,
Ohio State University.

EDWIN DILLER STARBUCK,
Leland Stanford Junior University.

SHORTER ARTICLES.

NOTES ON THE DEVELOPMENT OF THE POLLEN
TUBE AND FERTILIZATION IN SOME
SPECIES OF PINES.

DURING the past three years, I have devoted considerable time, under the direction of Professor George F. Atkinson, to a study of fertilization and related phenomena in certain species of pines. A preliminary paper was read before the Botanical Society of America at its Boston meeting, August, 1898. In June, 1900, a more complete report of the work was given in two papers, one of which was presented before the society named above at its meeting in New York City, and the other before the American Association for the Advancement of Science, which Association also met in New York City.

It has been found that the generative cell appears, as a rule, during the first summer rather than shortly before fertilization, as described by other investigators. This cell does not divide while in its place within the pollen grain, as stated by previous writers, but passes into the pollen tube before the sperm cells are formed. In the division of the generative nucleus, the spindle is monopolar in origin; it arises some distance below the nucleus in a prominent cytoplasmic condensation. From this denser area the protoplasm extends in a radial manner towards the periphery of the cell. The sperm nuclei are never separated by a cell wall, but remain surrounded by a common mass of cytoplasm. The two nuclei are of unequal size from the first, and the larger one is always in advance of the smaller one, as regards the apex of the pollen tube.

Just prior to fertilization a cavity is formed in the upper part of the egg cytoplasm. It is believed that this cavity represents the final act of the egg in its preparation for the reception of the sperm cell and other contents of the pollen tube. There is no evidence that it results from the presence, within the egg, of the elements from the pollen tube, as reported by certain writers. The sperm nucleus does not increase in size after its entrance into the egg, but remains much smaller than the nucleus of oosphere. The sexual nuclei come to lie side by side but do not fuse; both nuclei can still be

identified, even after the membrane of each has entirely disappeared. Two chromatic groups are clearly distinguished up to the nuclear plate stage.

In the division of the two segmentation nuclei, the chromatin of each nucleus forms two distinct spirems, which doubtless represent the separated-out paternal and maternal chromatic substance. At the time of this second division within the oosphere, the smaller sperm nucleus, which still lies in the upper part of the egg, frequently gives rise to a mitotic figure of more or less definiteness.

Only a few of the results which have been obtained are noted above. Papers giving the details of this research, with discussion and plates, have been sent to the publishers and will appear shortly.

MARGARET C. FERGUSON.

BOTANICAL DEPT., CORNELL UNIVERSITY.

NOTES ON ENTOMOLOGY.

WITH the December (1900) number the *Entomologische Nachrichten*, long edited by Dr. F. Karsch, closes its career. In its place will be issued a monthly index of entomological publications, called *Entomologische Literaturblätter*.

M. AUG. LAMEERE, in a recent proposed classification* of the Coleoptera, divides the order, according to the variation of the median vein of the hind wings, into three suborders; viz., Cantharidiformes, Staphyliniformes and Carabiformes; the last is equal to the Caraboidea of Ganglebauer. The second suborder equals the Staphylinioidea of that author with the important addition of the Pulicidæ.

M. Lameere's idea that the fleas are Coleopterous insects is certainly novel, and is based on a supposed affinity with *Platysyllus*, the well-known parasite of the beaver. The Cantharidiformes contains all the other families.

M. Lameere makes a list of the characters that (according to him) must have been possessed by the ancestor of Coleoptera; these characters indicate a Neuropterous insect of the group of Plannipennia. The most primitive Coleoptera he finds in the family Lymexylidæ.

* Notes pour la classification des Coléoptères. *Ann. Soc. Ent. Belg.*, 1900, pp. 355-357.

In this family two genera are mentioned which possess prominent ancestral characters: *Atractocerus*, with eight visible ventral segments, and *Hylecoetes*, with a rudimentary median ocellus.

PROFESSOR I. BOLIVAR describes * and figures a remarkable Coleopterous larva belonging to the family Lampyridæ which he received from the Philippines. At a casual glance the figure looks much like that of some fossil trilobite. The thorax is extremely large and broad, the head apparently sunk in the prothorax; the abdominal segments are small and laterally produced. M. J. Bourgeois, who has examined the figure thinks that it may belong to the genus *Broxylus*, a genus close to our *Calopteron*.

A. SKORIKOW in an article on some Collembola from Spitzbergen † gives a résumé of the known distribution of Collembola on Arctic islands. Of the thirty-four species only fourteen have been recorded from more than one island. Six species are common to four different islands, five of these being well-known European forms. He also tabulates the percentage of species in the various families and compares it to the Russian Collembola. This shows that in the Arctic regions the Aphoruridæ, Poduridæ and Isotomini are the predominant types, while in Russia the Entomobryini and Smythuridæ are the predominant forms.

MR. F. O. P. CAMBRIDGE has begun ‡ a revision of the genera of spiders with reference to their type species. He differs considerably from both Simon and Thorell, who have previously investigated this subject. He makes several important changes in this part. The genus *Drassus* is held not to be a synonym of *Gnaphosa*; *Micromata* becomes transferred to the Clubionidæ, with *M. accentuata* Walck. as type; and *Salticus* has for its type *S. scenicus*, so that *Epiblemum* falls to the synonymy. It is doubtful, however, if Mr. Cambridge's work will lead to greater uniformity in the use of genera of spiders, as so much depends on the rules used

in type-fixation. Few of the ancient authors had the slightest idea of a genotype, so that every attempt to read this modern idea in their writings will be largely influenced by opinion. In fact there is less uniformity in the use of genera of spiders than there was ten years ago.

S. PROWAZEK has studied * the development of a Collembolan, *Isotoma grisea*, and finds, among other interesting matters, that the antennæ are primitively post-oral, and attain their pre-oral position at a later stage.

MM. J. DANYSZ and K. WIZE have published a little brochure † on the use of fungous diseases against *Cleonus punctiventris*, a weevil injurious to beets and mangel-wurzels in Central Europe. The value of this method had previously been shown by several Russian experimenters, notably by Professor Krassil-stchik, of the University of Odessa. The work of the French writers has been principally on methods of inoculating the soil. They found that where the beet is cultivated by rotation every four or six years the fungus was apt to die out. Therefore, they have devised methods for inoculating the beet fields anew each year.

NATHAN BANKS.

WORKING OF PATENTS ACTS.

PROBABLY no single influence has had more to do with the advancement of the industrial interests of the United States and with the resultant prosperity of the nation than the patent-acts. They were fundamental elements of primary legislation on the organization of the Government, and Hamilton and other of those early statesmen to whom so much is due initiated a patent system as a first and most effective instrument in the development of manufactures in a country previously deprived of those industries through the repressive legislation of the mother country. The patent system of the United States became a model for the world and, very slowly but none the less steadily, other nations, one by one, took up its most distinctive methods. The United States promptly

* *Arbeit Zool. Inst. Wien*, XII. (1900), pp. 335-370.

† *De l'utilisation des Muscardines dans la lutte avec le Cleonus punctiventris*. Paris, 1901.

* Dos formas larvarias de lampiridos. *Act. Soc. Española de Historia Natural*, Vol. XXVIII., 1899, p. 130-133.

† *Annuaire du Musée Zoologique Acad. Imp. St. Petersburg*, Vol. V. (1900), p. 190-209.

‡ *Ann. Mag. Nat. Hist.*, 1901, Jan., pp. 51-65.

secured a lead, as great in its field as has become, meantime, that of Germany in industrial education. During late years, the patent system of Great Britain, formerly exceedingly crude, costly to the inventor and the nation, and in all ways unsatisfactory to those who were unselfishly and honestly interested in the advancement of British trade, has been greatly modernized and liberalized; but it has not, even yet, been made fairly comparable with that of the United States.

An important commission, appointed by the Board of Trade and composed of some of the ablest experts and best known men in the kingdom, has just reported upon its operation and it is perhaps possible to deduce from this report conclusions that may be useful in promoting the still further improvement of our own system, of late years reduced rather than improved in its efficiency by legislation and by official interpretations of doubtful provisions of law. After examining into the operation of the British patent laws and receiving the testimony of officials of the patent office, of referees, litigants, users of patented articles, patent agents and experts, the commission reported.

It was found that, of patents issued, only 57.6 per cent. were actually novel and unanticipated by previous invention. Nearly 7 per cent. had been fully anticipated in all details; 35 per cent. had been partially anticipated; a few were claims on old devices and others described no method of manufacture. Forty-two per cent. had thus been anticipated, in whole or in part.

The commission states its opinion that the granting of invalid patents is thus a very serious evil and one which should be at once abolished. A method of examination like that of the U. S. Patent Office is recommended, and a scrupulous system of detection and elimination of anticipated claims. It recommends, however, a curious limitation: That "the publication of an invention in specifications of letters patent granted in the United Kingdom dated fifty years or more previous to the date of the application, or in a provisional application, of any date, of the kind before mentioned, shall not in itself be deemed an anticipation of the invention."

It is recommended that time, not to exceed two months (two years time is given in the United States Patent Office) should be allowed for amendment of a claim, and that a system of appeal, very like that long in operation in the United States, be allowed in case of rejection. This provision, restricting amendment to a period of two months, if it had been adhered to in the United States, would have prevented the litigation now in progress over the Berliner and other patents in this country, and would have saved a vast amount of expense to the litigants and insured a larger employment of inventions in improvement of existing practice and would have saved enormous injury to patentees and to the nation.

This British commission also considers the matter of compulsory licenses. It often happens, in that country as in this, that valuable patents are purchased by wealthy and powerful interests and simply held, unused, to prevent their competition with the holders and to evade that serious difficulty often met with in the compulsory replacement of existing and fairly satisfactory apparatus by the improved device. Every great corporation and many smaller organizations hold patents thus concealed and out of use, until their own special interests make it desirable to put them into use; and the public is thus defrauded of all that advantage, meantime, which is its proper compensation for the establishment and maintenance of a patent system. The British patent laws have, for nearly twenty years, provided, as have not those of the United States, against this abuse. It is made the duty of the proper officials to grant an order compelling the holder of the patent to grant licenses on terms to be adjudged fair and equitable by the proper government officials. This provision has been subject to some criticism in its details, and the commission advises its amendment and improvement; adhering, however, to the underlying principle that the public should not lose its rights or the advantage assumed to be gained by it when providing the legal forms of a patent system and of protection to the inventor. It is recommended that the 'High Court' shall receive and consider complaints reciting the facts, if they so prove, that the applicant is in-

terested in the invention, that the reasonable requirements of the public have not been satisfied, by reason of the refusal or neglect of the patentee to work, or to grant licenses to work, the patent, and that the court, if the assertions of the claimant appear to be justified by the facts, shall make an order conferring a license upon the applicant on terms found by the court itself to be just and reasonable.

Reciprocity in patent matters is advised as between Great Britain and other countries prepared to offer similar facilities and protection for the foreign patentee. It would be an excellent reform could a real international reciprocity, based on the best practice of the United States, be arranged to include Germany; which country has illustrated some very objectionable and inequitable patent law methods.

Should the recommendations of the commission be accepted and the British Office be reconstructed as proposed, it will provide as practically satisfactory a system of protection as does that of the United States; changing thus from one of the most useless to one of the best of patent systems of the time. It will be interesting to note whether Great Britain, after all, will ultimately provide a more equitable system in regard to purposely delayed issues and unworked patents—the two main defects and abuses of the existing law of the United States—than our ‘pioneer’ code now offers. It will be most discreditable if our committees of Congress and our Commissioners of Patents do not initiate, and Congress perfect, remedies for these two radical and inexcusable defects in our own patent law.

R. H. THURSTON.

A MINERAL SURVEY IN TEXAS.

THE Legislature of the State of Texas has recently passed an act (House Bill 135), approved by the Governor, March 28, 1901, providing for “a mineral survey of the lands belonging to the public schools, university and asylum, or of the State, and to make appropriation therefor, and to provide a penalty for unlawfully disclosing information obtained by such survey; and to loan and authorize the removal to the University of the geological and scientific equipments, collections, specimens and

publications now in charge of the Commissioner of Agriculture, Insurance, Statistics and History; and also declaring an emergency.”

By Section 1 the “Board of Regents of the University of Texas are authorized and directed, as soon as practicable, to have made a mineral survey of all lands belonging to the public schools, university, asylums, or of the State.”

Section 2 requires that “said Board shall employ for that purpose persons skilled, who have had at least five years’ experience, in the science of mineralogy, geology and chemistry, who shall conduct said survey. * * *”

Section 3 relates to the publication annually ‘for free distribution among the people of the State [of] all practical information collected in the prosecution of said survey as it progresses.’ It provides, as a penalty, a fine ‘not exceeding one thousand dollars or two years in jail’ for divulging information concerning the public school, university, asylum or State lands in advance of publication.

In Section 4 provision is made ‘for assays, analyses and other scientific examinations of specimens of mineral substances found in the State, and for the collection and distribution of statistics relating to the mineral production of the State. * * *’ For the assays, etc., a ‘uniform and reasonable charge shall be fixed,’ except at the request of the Governor or Commissioner of the General Land Office the examination of specimens found upon any of the public lands shall be made free of charge.

Section 5 provides for instruction in the University of Texas ‘in practical economic and field geology and mineralogy,’ and for the distribution of duplicate specimens to the A. and M. College.

Section 6 authorizes the removal of the specimens, books, and equipment (brought together by the Dumble Survey) now in charge of the Commissioner of Agriculture, Insurance, Statistics and History, to the University. These materials are ‘loaned to said board, until such time as the State may desire to otherwise use them.’

Section 7 reads as follows: “For the purpose of carrying out the provisions of this Act, the sum of ten thousand dollars per annum for two years, or so much thereof as may be necessary,

is hereby appropriated out of the general revenue of the State; provided that said mineral survey of the State shall be completed within two years."

Section 8 repeals all laws in conflict with the Act, and Section 9 declares an emergency.

It is the intention of the Board of Regents to immediately institute the work of the survey, which will probably be under the direction of Dr. William B. Phillips, who is in charge of economic and field geology in the University.

FREDERIC W. SIMONDS.

SCHOOL OF GEOLOGY,

UNIVERSITY OF TEXAS, April 6, 1901.

PROPOSED SURVEY OF THE ANTIQUITIES OF MICHIGAN.

THE following bill has been introduced in the Michigan Legislature, was reported favorably by the Committee on State Affairs, and is at present referred to the Committee on Ways and Means. An amendment limiting the survey to two years has been made.

The people of the State of Michigan enact:

SECTION 1. That a survey of the antiquities of Michigan be, and the same is hereby established.

SECTION 2. That the survey shall be in charge of a commission comprising the Governor of the State *ex-officio*, the President of the University of Michigan, the President of the Michigan Academy of Sciences, the President of the Pioneer and Historical Society and the President of the Detroit Archeological Society; this commission to serve without compensation, but to be reimbursed for their actual and necessary expenses.

The commission shall have the power to employ an archeologist and one or more assistants and to make such incidental expenditures as the nature of the work may require. The accounts for salaries and other expenses provided herein shall be paid upon the warrant of the Auditor-General monthly, upon the approval of the Governor. At the end of each fiscal year the commission shall cause to be made an annual report, the copy for which, as soon as completed, shall be forwarded to the clerk of the Board of State Auditors for publication by the State printer, the expense of such publication to

be paid from the general fund of the State upon the allowance of the Board of State Auditors.

SECTION 3. For the purpose of carrying out the provisions of this act, exclusive of the cost of publishing the annual reports, there is hereby appropriated from the general fund of the State for the fiscal year ending June thirty, nineteen hundred and two, and each fiscal year thereafter, the sum of two thousand five hundred dollars.

THE DAVENPORT ACADEMY OF SCIENCE.

THE annual meeting of the Academy was held on January 25th in Davenport, Iowa. The reports for the year were most encouraging.

We learn from Mrs. Mary L. D. Putnam, President of the Academy, that the Academy has purchased the corner property adjoining its present building and converted the church into a most attractive lecture hall; the high basement makes a fine room to relieve the former crowded museum. The two buildings are connected by a spacious and well-lighted passageway which may also be utilized for museum purposes.

The scientific library of 10,800 bound volumes has been completely catalogued exclusive of a large collection of pamphlets. The library has been acquired by the exchange of the proceedings of the Academy with home and foreign scientific societies.

The Academy is one of the oldest of the scientific institutions in the West, and on December 14, 1900, celebrated the 33d anniversary of its founding by the dedication of Science Hall. President MacLean and Professor Nutting of the State University of Iowa made addresses, and Professor Starr, of the University of Chicago, gave a lecture 'Among Mexican Indians.'

It is planned to give free scientific lectures from time to time in this hall.

With its large museum, especially rich in archeology and enlarged by the recent gift of the rare Griswold College Collection, including 2,000 scientific books, and with its valuable property, the Academy is on a permanent basis, needing only an addition to its general endowment fund.

The publication is assured by the Putnam Memorial Fund. The income of this fund of

\$10,000 has enabled the Academy this last year to bring out Volume VII., containing 316 pages and seventeen full-page plates.

PROPOSED JOURNAL FOR THE STATISTICAL STUDY OF BIOLOGICAL PROBLEMS.

It is proposed to establish a *Journal of Biological Statistics* which may serve as a means not only of collecting under one title biological data of a kind not systematically collected or published in any other periodical, but also of spreading a knowledge of such statistical theory as may be requisite for their scientific treatment. The following remarks are offered in justification of this proposal:

A very few years ago, all those problems which depend for their solution on a study of the differences between individual members of a race or species were neglected by most biologists. The complexity of organic structure is so great, and the number of distinguishable forms so enormous, that morphologists were obliged to simplify their conceptions by constructing for every species an ideal type, to which the individuals composing it conform with more or less exactness, and to neglect those deviations from the type which actually occur. Such simplification was not only justifiable, but absolutely necessary for many purposes; it has rendered enormous service to biology in the past, it does so still and will continue to do so; nevertheless, there are many problems which can not be dealt with by its aid.

The starting point of Darwin's theory of evolution is precisely the existence of those differences between individual members of a race or species which morphologists for the most part rightly neglect. The first condition necessary, in order that any process of natural selection may occur among a race or species, is the existence of differences among its members; and the first step in an enquiry into the possible effect of a selective process upon any character of a race must be an estimate of the frequency with which individuals, exhibiting any degree of abnormality in respect to that character, occur. The unit, with which such an enquiry must deal, is not an individual but a race, or a statistically representative sample of a race; the result must

take the form of a numerical statement, showing the relative frequency with which the various kinds of individuals composing the race occur.

As it is with the fundamental phenomenon of variation, so it is with heredity and with selection. The statements that certain characters are selectively eliminated from a race can only be demonstrated by showing statistically that the individuals which exhibit that character die earlier, or produce fewer offspring, than their fellows: while the phenomena of inheritance are only by slow degrees being rendered capable of expression in an intelligible form as numerical statements of the relation between parent and offspring, based upon statistical examination of large series of cases, are gradually accumulated.

These, and many other problems, involve the collection of statistical data on a large scale. That such data may be rendered intelligible to the mind, it is necessary to find some way of expressing them by a formula, the meaning of which can be readily understood, while its simplicity makes it easy to remember. The recent development of statistical theory, dealing with biological data on the lines suggested by Mr. Francis Galton, has rendered it possible to deal with statistical data of very various kinds in a simple and intelligible way, and the results already achieved permit the hope that simple formulæ, capable of still wider application, may soon be found.

The number of biologists interested in these questions, and willing to undertake laborious statistical enquiries, is already considerable, and is increasing. It seems, therefore, that a useful purpose would be served by a journal especially devoted to the publication of statistical data, and of papers dealing with statistical theory. Many persons are deterred from the collection of such data, by the difficulty of finding such a means of publishing their results as this journal would afford, and those results which are published frequently lose much of their value because the data on which they are based are withheld, or because they are isolated in publications largely devoted to other forms of investigation.

It is suggested that '*Biometrika*, a Journal for

the Statistical Study of the Problems of Evolution,' should be published, in the first instance, quarterly, four numbers forming a volume. It is hoped that it will include (a) memoirs on variation, inheritance and selection in animals and plants, based upon the examination of statistically large numbers of specimens (this will of course include statistical investigations in anthropometry); (b) those developments of statistical theory which are applicable to biological problems; and (c) abstracts of memoirs, dealing with these subjects, which are published elsewhere. It is proposed to include memoirs written in English, German, French or Italian.

The expense of such a journal would be at first considerable, and it cannot be undertaken without some promise of support. Those willing to assist in supporting such a journal are requested to write either to Professor Karl Pearson, F.R.S., University College, London, or Professor W. F. R. Weldon, F.R.S., Merton Lea, Oxford, agreeing to purchase the first volume of *Biometrika* at the price of 30 shillings.

RESIGNATIONS FROM THE SCHOOL OF PEDAGOGY NEW YORK UNIVERSITY.

We published last week a letter from Professors Weir, Buchner and Judd announcing their resignation from the School of Pedagogy, New York University. In view of comments made by Chancellor MacCracken, we have been asked to publish the following statement signed by Professors Weir, Buchner and Judd:

There have been long-continued disagreements within the Faculty of Pedagogy on points of general policy. The advice of the Chancellor on these matters could not be obtained, as the Chancellor has declined to attend Faculty meetings for more than a year, and has not attended more than two or three times during the last three years. Appeals made to the authorities of the University on matters of general policy were not taken up for definite consideration until in February of this year when two long hearings were held before a Council Committee, consisting of Chancellor H. M. MacCracken, Dr. George Alexander, Chairman; Willis Fletcher Johnson, Secretary; Henry Van Schaick, and a number of ladies of the woman's advisory committee, including Mrs.

Henry Draper, Miss Helen M. Gould, and Mrs. Eugene Smith. These hearings dealt with questions of administration and curriculum.

After these two hearings and after a meeting of the council of the University on March 4th, the Chancellor announced to the members of the faculty that he had accepted the resignation of the dean of the School of Pedagogy from the deanship. The Chancellor also sent word to one of the members of the faculty that the general theory of reconstruction would make it necessary to vacate his chair in order to make room for a new Dean. The member who was thus to be superseded made an effort to find out the grounds of this theory of reconstruction. He was informed that no criticisms of his academic work and conduct had been communicated to the Chancellor. The only semblance of a reason for the theory appeared in certain vague and indefinite impressions entertained by some of the members of the woman's advisory committee. The other two members of the faculty made an effort to find out the grounds of this theory of reconstruction. They were unable to find reasons other than those already stated, excepting the additional fact that the Chancellor had not in the beginning favored the appointment of this professor. They accordingly entered a vigorous protest, both in person and by correspondence, to the Chancellor and Dr. George Alexander, against what they regarded as an unwarranted and unjust line of action.

The committee of the council, including the members of the woman's advisory committee, then held on April 4th a meeting, and passed a resolution to recommend to the Council that the chairs of all professors of the Faculty of Pedagogy, not vacated by resignation, be declared vacant by the council at its May meeting. It should be noted that this resolution applies not merely to the three professors who have resigned, but to all professors in the School of Pedagogy.

On learning of this action on the part of the Council Committee, the members of the faculty made an effort to get into correspondence with the Chancellor and secure some statement of the grounds of this latest action. The Chancellor withheld the information requested; where-

upon, Professors Weir, Buchner, and Judd resigned from the University. The following is a copy of the resignation sent by each of the professors to the Chancellor:

April 12th.

To the Chancellor of New York University:

Because of long-continued dissatisfaction with the administration of the School of Pedagogy, and because I have learned that the repeated efforts of certain members of the faculty to improve this administration, while they have met with a sufficient degree of official approval to mark these efforts as thoroughly justifiable, have, notwithstanding, resulted in a resolution on the part of a Committee of the University Council to recommend that the chairs of all Professors of the School of Pedagogy be vacated at the May meeting of the Council, I therefore resign my professorship in the University, this resignation to take effect at the close of this university year.

I respectfully request that an official statement of the fact, which has been at different times informally stated, that my academic work and conduct as a professor in the University have been satisfactory, be sent to me at once.

A MEETING of students and alumni of the School of Pedagogy was held in the University Building, Washington Square, on April 20th, and the following resolution was passed:

To the Council of the New York University:

We, the former and present students of the School of Pedagogy of New York University, having learned through the public press of the resignations of Professors Weir, Buchner and Judd from the Faculty of the School of Pedagogy:

Hereby beg leave to express our firm belief that the loss of these professors from the Faculty will greatly weaken public confidence in the institution, and will undoubtedly impair its usefulness in the future. These gentlemen are everywhere recognized as thorough scholars, inspiring instructors, and men of sound judgment and impressive personality.

We beg leave, therefore, to express our further conviction that the University will do itself and the educational public of this city a service by securing, if possible, a withdrawal of these resignations.

SCIENTIFIC NOTES AND NEWS.

MR. ALEXANDER AGASSIZ, of Cambridge, Mass., has been elected president of the National Academy of Sciences. The further transactions of the Academy are recorded in a special article published above.

PROFESSOR G. L. GOODALE, of Harvard University, has been appointed delegate from the National Academy of Sciences to the International Association of Academies meeting in Paris.

PROFESSOR E. B. WILSON, of Columbia University, has been invited to deliver the annual address before the Medical School of Yale University.

PRESIDENT ELIOT, of Harvard University, is expected to return to Cambridge this week. He has been for the past three months in Bermuda and the West Indies.

WE learn from the *Botanical Gazette* that a handsome silver loving cup was presented by a number of teachers to Mr. Thomas Meehan, the veteran horticulturist and botanist of Philadelphia, on the occasion of his seventy-fifth birthday.

DR. JAMES E. TALMAGE, professor of geology in the University of Utah, has been elected a life associate in the Philosophical Society of Great Britain, otherwise known as the Victoria Institute, and also a corresponding member of the Royal Scottish Geographical Society.

MR. L. DE NICÉVILLE has been appointed entomologist in the Indian Museum, Calcutta.

WE learn from *Nature* that Professor Eugen Warming and Dr. Victor Madsen have been appointed to the Danish Geological Survey, and that Dr. H. Topsøe has retired from the Survey.

THE Adams prize of Cambridge University for the present year has been awarded to Mr. H. M. MacDonald, of Clare College, for a paper on 'Electric Waves.'

MR. C. E. BORCHGREVINK, the Antarctic explorer, has been created a Knight of the Order of St. Olaf by King Oscar of Sweden and Norway.

DR. ROBERT E. MORITZ, of the University of Nebraska, has received leave of absence for next year which he will spend in study in Germany.

PROFESSOR WATASÉ informs us that at the meeting of the Zoological Society of Tokio, held at the Zoological Institute of the University of Tokio, March 15, 1901, Professor Bashford Dean, of Columbia University, gave an account of his trip to the Philippines. Among others,

he gave a very graphic account of the habits of *Nautilus* which he had observed during his stay at Negros.

PROFESSOR FREDERICK W. STARR, of the University of Chicago, has returned from a four months' expedition among the Mexican Indians. He has secured valuable busts, photographs and collections.

THE section of vertebrate paleontology of the Carnegie Museum will have four field parties engaged during the coming summer in exploring the fossil-bearing horizons of the West. The work will be under the general direction of Mr. J. B. Hatcher, the Museum's curator of vertebrate paleontology. One party will operate near Cañon City, Colorado, where during the past winter a valuable deposit of Dinosaur bones has been unearthed by Mr. W. H. Utterback. A second party will be in charge of Mr. C. W. Gilmore, and will continue the work that has been so successful during the past two seasons in southern Wyoming. A third party will be in charge of Mr. O. A. Peterson, and will explore the Tertiary deposits of western Nebraska, while the fourth party will devote its attention to the Cretaceous and Tertiary deposits of southern Montana. Important results are expected from the various field parties.

DR. HENRY C. COWLES will conduct an expedition of students from the botanical department of the University of Chicago to the mountains of northwestern Montana and northern Idaho during August and a part of September. The purpose of this trip will be an ecological study of the various mountain conditions.

S. M. TRACY, of Biloxi, Miss., has chartered a schooner for the summer, and will spend the next six months in a botanical exploration of the islands along the coast of the Gulf of Mexico. May, June, September and October will be spent on the south Florida coast, and July and August on the Texas coast.

PROFESSOR ENGLER, director of the Botanical Garden at Berlin, is about to visit the Canary Islands, in order to study their flora; at the same time the botanist, Dr. Josef Bornmüller, will also make an expedition.

THE funeral of the late Professor Henry A. Rowland took place during the recent meeting of the National Academy of Sciences, and Dr. S. P. Langley, Secretary of the Smithsonian Institution, and Dr. T. C. Mendenhall, President of the Worcester Polytechnic Institute, were appointed a committee to represent the Academy.

A PORTRAIT of the late Dr. William Pepper was presented to the American Philosophical Society on April 12th by a number of members of the Society. An address was made on the occasion by Dr. Horace Howard Furnace.

DR. FREDERICK J. BROCKWAY, assistant demonstrator in anatomy in the College of Physicians and Surgeons, Columbia University, died of meningitis at Brattleboro, Vt., on April 21st. He was born in 1860 and took his A.B. at Yale and his M.D. from the College of Physicians and Surgeons.

WE regret also to record the death of Richard P. Rothwell, since 1873 editor of the *Engineering and Mining Journal*. He was born in Ontario, Can., in 1836, and studied at Trinity College, Toronto, the Rensselaer Polytechnic Institute and the Paris School of Mines. Mr. Rothwell made numerous inventions and had a large practice as consulting mining engineer. He was president of the American Institute of Civil Engineers in 1872, and was a member of numerous foreign and American Scientific Societies. In connection with the *Engineering and Mining Journal* he published annually 'The Mineral Industry, its Statistics, Technology and Trade,' and the company of which he was president, The Scientific Publishing Company, issued many books relating to industry and mining. His death, which was due to cancer, occurred on April 17th.

PROFESSOR JOSEF VON FEDOR, professor of hygiene in the University of Buda Pesth and the author of many works on this science, has died at the age of fifty-seven years.

THE death is also announced of Dr. P. Kohlstock, lecturer on tropical hygiene at the University of Berlin, and known for his researches on cholera and other subjects. He died at Tien-Tsin, where he was engaged in research.

A PRESS cablegram from Berlin states that Dr. Menke, leader of a German scientific expedition in the South Sea Islands, has been murdered by natives of Macquarie Islands. Two other members of the expedition were wounded.

THE Legislature has not made an appropriation with which the New York Pathological Institute can pay rent for the laboratory it now occupies, and it will be necessary to remove the fine equipment to Manhattan State Hospital on Ward's Island. Dr. Ira Van Gieson will not be continued as director of the Institute after the first of May.

A CORRESPONDENT in San Francisco informs us that the bill making it a felony to publish that cholera or bubonic plague exists within the State of California, unless the fact has been entered on the minutes of the Board of Health, after having been passed by one branch of the Legislature was dropped. Dr. John J. Kinyoun, federal quarantine officer at San Francisco, to whom we understand the investigation of the plague in that city was due, has been transferred at the request of commercial organizations. The attitude of the San Francisco press towards the investigations of the plague by the federal authorities is shown by the following extract from the *Call* of April 16th.

Dr. Kinyoun was the worst enemy the State had ever had. His circulation of bubonic plague reports inflicted incalculable injury upon the State in general and San Francisco in particular. The salient fact that a number of deaths in the Chinese quarter during the past twelve months, with Dr. Kinyoun's bubonic nightmare thrown in, was no greater than for any one of the preceding years, could not stay the damage done by Kinyoun's sensational declarations.

IN the *London Times* and in *Nature* we find some information regarding the inaugural meeting of the International Association of Academies which was called to meet in Paris on the 16th inst. The following delegates were expected to be in attendance: Amsterdam, Professor H. G. van de Sande Bakhuysen, president of the physico-mathematical section of the Academy; Professor H. Kern, president of the section of letters; Professor J. de Goeje. Berlin: Professor H. Diels and Professor W. Waldeyer, permanent secretaries of the Prussian Royal

Academy of Sciences; Professor R. Helmert; Professor J. H. van't Hoff; Professor T. Mommensen; Professor E. Sachau. Brussels: Lieut.-General de Tilly; Professor P. Fredericq. Budapest: Professor C. Than; Professor I. Goldziher. Christiania, not yet announced. Göttingen: Dr. E. Ehlers and Dr. F. Leo, secretaries of the Society; Professor E. Riecke. Copenhagen: Professor J. L. Heiberg; General G. Zachariæ. Leipzig: Professor W. His; Professor A. Fischer; Professor H. Gelzer. London: Sir Michael Foster and Professor A. W. Rücker, secretaries of the Royal Society; Dr. T. E. Thorpe, foreign secretary of the Society; Sir Norman Lockyer; Sir Archibald Geikie; Professor A. R. Forsyth; Professor E. Ray Lankester; Professor A. Schuster. Munich: Professor W. Dyck; Professor F. Lindemann; Professor K. Krumbacher. Paris, Academy of Inscriptions and Belles Lettres: Count De Lasteyrie, president; MM. P. Berger, vice-president; H. Wallon, permanent secretary; L. Delisle; G. Boissier; Bréal; Barbier De Meynard; Senart; E. Müntz. Academy of Sciences: MM. Fouqué, president; Bouquet de la Grye, vice-president; Berthelot and Darboux, permanent secretaries; Marey; H. Poincaré; Moissan; Lannelongue. Academy of Moral and Political Sciences: Count de Franqueville, president; G. Picot, permanent secretary; Gréard; Glasson; Lachelier; Sorel; Boutroux. St. Petersburg: MM. Famintzin; Backlund; Oldenbourg; Kouliabko. Rome: Professor S. Cannizzaro; Professor A. Mosso; Professor I. Guidi. Stockholm: Professor G. Retzius, president of the Academy of Sciences. Washington: Professor G. L. Goodale. Vienna: Professor Victor von Lang, general secretary of the Academy of Sciences; Professor T. Gomperz; Professor Leopold von Schroeder; Professor J. Karabacek; Professor J. C. Zirecek; Professor A. Rollett; Professor G. Tschermak. The delegates were to be officially welcomed to Paris by the French Government and the Institute of France; and the arrangements for their pleasure included receptions at the Château de Chantilly, bequeathed to the Institute of France by the Duc d'Aumale, at the French Academy and elsewhere, a visit to the Bibliothèque Nationale under the conduct of its

accomplished director, M. Léopold Delisle, and a special representation at the Comédie Française. On Thursday, the 18th, the Institute of France would give a dinner in honor of the assembly, and on Saturday the delegates were to be entertained at a banquet by the Paris Municipal Council. Regarding the scientific work of the Association, we find less information, but it is said that the Royal Society has on the agenda a proposal relating to the desirability of connecting the measurements of Struve upon the arc of meridian 30° E., with those of Gill on the same meridian in South Africa, and the Paris Academy raises the question of the standardization of the recording instruments used in physiology and increased uniformity in the methods of that science.

THE American Metrological Society held its annual meeting at Washington on April 19th with the President, Dr. T. C. Mendenhall, in the chair. Dr. Mendenhall made an address on the recent progress of the metric system here and abroad. Among the other papers was one by Dr. S. W. Stratton, director of the newly established Bureau of Standards, on the plans for the Bureau.

THE annual meeting of the Society for the Promotion of Engineering Education will be held at Buffalo, June 29, July 1 and 2, 1901. The sessions will be held in 933 Ellicott Square.

THE Buffalo Society of Natural Sciences has announced a series of lectures to be given by Mr. Frederick Houghton of the Buffalo schools beginning April 25th. They are on physical geography and are designed specially for teachers. Each lecture will be followed by an excursion to study the local physical conditions described.

THE subject for the Adams Prize at Cambridge University for 1903 is 'The bearing on mathematical physics of recent progress in the theory of the representation of discontinuous quantity by series, with special consideration of the logical limitations of the processes involved,' the value of the prize is about \$1,100, and it is open to those who have taken a degree at Cambridge. The subject for the Sedgwick prize, 1903, is 'The Petrology of some Group of British Sedimentary Rocks.'

THE Fossati Prize of the Lombard Academy of Sciences and Letters will be awarded in 1902 for an essay on the 'Minute or gross anatomy of the brain.' In 1903 the subject is 'The termination of the cranial nerves in the brain.' The prize is of the value of about \$400 and is open only to Italians.

THE *American Mathematical Journal* announces that the Naples Academy of Mathematical and Physical Science has awarded its mathematical prize of 100 lire for 1899 to Dr. G. Torrelli at Palermo for his work on the totality of prime numbers. The subject for the next award is the theory of invariants of the ternary biquadratic, considered preferably in relation to the condition for splitting into lower forms. The essays, which may be written in Italian, French or Latin, must be sent in before March 31, 1902. The next annual prize of the Madrid Academy of Sciences will be awarded for a historical memoir on the Spanish mathematicians of the 16th century.

THE Peruvian Government has offered to give Harvard University additional land for its observatory at Arequipa.

MAYOR VAN WYCK has approved the bill passed by the Legislature enabling the city of New York to accept Mr. Andrew Carnegie's gift of \$5,200,000 to erect sixty-five branch libraries.

REUTER'S AGENCY is informed that the whaler *America* which has been bought by Mr. Evelyn B. Baldwin, the American explorer, for his forthcoming journey to the North Pole, will sail from Dundee on June 18th, by which date Mr. Baldwin expects to arrive from the United States. The *America* will proceed direct to Norway, where she will join the two other ships which are to form part of the expedition, and, after taking on board stores and equipment, will proceed North. Mr. Baldwin will, it is said, take with him 500 dogs and a number of mules. Work is now in progress for preparing the *America* for her voyage, the ship having been fitted with new masts and a new fore-castle, and having been practically redecked. The vessel, formerly known as the *Esquimaux*, is an auxiliary steam whaler, and has been employed in the whaling industry for

nearly 30 years. Recently she was chartered as a private yacht, and, in addition to the accommodation usual on whalers, has had a suite of commodious cabins specially built in a deck-house aft. Her tonnage is 800, and her 100-horse-power engines give her a speed of seven knots. She is a good sea boat and well fitted to withstand Arctic ice pressure; last year while in Davis Straits she succeeded in getting out of the ice-pack from which a number of other whalers were unable to extricate themselves. Mr. Baldwin has himself left New York to join the *America*. We are unable to learn what scientific men are accompanying the expedition or what scientific work is proposed.

THE daily papers report that the department of physics of Cornell University has set up a camera with which to take each day one picture of the new anatomical laboratory in course of construction. The negatives will be taken on a long bioscopic film, and be used to produce a moving picture of the building from the beginning of its foundation to its completion.

THE *Experiment Station Record* states that the agricultural council of the Russian Ministry of Agricultural and Imperial Estates has taken steps in the direction of improving the character of the live stock and the live stock industry in general of that country. At present this industry is said to be far behind that of other countries, the animals kept being inferior and stock-raising receiving comparatively small attention from the farmers. The council has recommended the holding of live-stock shows, with prizes for excellence, the establishment of breeding farms and furnishing of expert assistance in purchasing good breeding animals, the maintenance of local breeding establishments where the service of pure-bred animals can be secured, and loans to municipalities and societies for the purpose of purchasing pure-bred animals and providing for their care. In order to carry out the above measures the Ministry of Agriculture, with the concurrence of the Minister of Finance, has recommended an appropriation of 5,000,000 rubles (about \$2,000,000) to begin this work and a quadrennial appropriation of 1,125,000 rubles.

WE learn from the same source that at the

third agricultural congress, held at Barbados, January 5th, Dr. D. Morris, commissioner of agriculture for the West Indies, described the progress which is being made under the Imperial Department of Agriculture in the direction of agricultural experimentation and investigation. During the year three new experiment stations have been established at Montserrat and one at Tortola for the Virgin Islands. At the present time there are 9 botanic stations maintained from imperial funds under the charge of the Imperial Department of Agriculture. In addition, there are 20 substations, or experiment plats, started at Grenada, St. Vincent, St. Lucia and Dominica to encourage the improved cultivation of cacao, coffee, limes and other crops. There are 12 central, manual and local stations associated with the sugar-cane experiments at Barbados, 7 similar stations at Antigua and 3 at St. Kitts-Nevis. Experimental cultivation with food and other crops will be carried on in connection with all the agricultural schools. During the past year lectures to teachers in charge of elementary schools have been carried on in every part of the West Indies, and the belief is expressed that within a year or two, in the smaller islands at least, every teacher in charge of a school should be qualified, not only to give a certain amount of instruction in the principles of agriculture, but also to interest the children by simple experiments followed by practical demonstrations in the cultivation of plants suited to the district. The first agricultural school in the West Indies affording secondary education for boys was opened at St. Vincent in September, and a similar school was opened at Dominica in December, 1900. It is planned to establish two more agricultural schools during the present year, one at St. Lucia and another, combining the characters of an agricultural school and grammar school, at St. Kitts. Seven scholarships in agriculture at Harrison College, Barbados, have been established by the Imperial Department of Agriculture. Agricultural fairs have been successfully conducted, and have proved of value in stimulating effort toward better production. The Department of Agriculture has encouraged these by prizes amounting to £350 and the distribution of 100 diplomas.

UNIVERSITY AND EDUCATIONAL NEWS.

THE Minnesota Legislature has appropriated \$60,000 for the College of Engineering of the State University.

THE University of Cambridge conferred last year degrees as follows: M.D., 13; Sc.D., one; Litt.D., one; Mus.D., one; B.D., three; M.A., 342; LL.M., 11; M.B., 49; B.Ch., 61; B.A., 668; LL.B., 44; Mus.B., two.

A PROPOSAL is before the German Federal Council to admit to the medical course in the University students who have certificates from the Realschule, instead of insisting as heretofore upon the classical training of the Gymnasia. The Berlin Medical Society, at a recent meeting, discussed, according to the *British Medical Journal*, this question, and passed a resolution affirming that the certificate of classical instruction should alone give the right of admission to the medical examinations, but on the proposition of Professor Virchow it was agreed to add the declaration that the admission of pupils from modern schools to the medical classes should be subject to the same rules as in the other faculties.

FOR some time there has been an agitation in Liverpool to have a university established in that city. We learn from the *London Times* that Mr. A. L. Jones, of Messrs. Elder, Dempster, and Co., has brought the subject under notice in a practical form. At a recent dinner in commemoration of the new steamer, *Sekondi*, just added to the West African fleet of Messrs. Elder, Dempster, and Co., being about to start on her maiden voyage, Mr. Jones, in proposing 'The African Trade,' said that they had a tropical school in Liverpool which had done a great deal to reduce mortality from tropical diseases, and they hoped to have a cathedral and a university. He would be delighted to see a university established, and would be pleased to give a contribution of £5,000 towards that purpose. That was not much, and he was glad to think that the contributions to follow would be much larger. Manchester men did not treat their native city as Liverpool men did. Liverpool must have a cathedral and a university, and not continue

to shirk her responsibilities. Mr. A. F. Warr, M.P., in proposing 'The Liverpool School of Tropical Medicine,' said that they would not have discharged their duties until they had established a cathedral and university in the city. Professor Boyce responded, and referred to the loss sustained by the death of Dr. Myers, whose family had given £1,000 to the school, and his brother £500. They had established an absolutely international school, which had served as an example to others. Fellowships had been established at University College for the benefit of colonials and others, and the school has shown what a success a real university could be made in Liverpool.

MR. SAMUEL M. COULTER, fellow at Chicago University, has been appointed instructor in botany at Washington University.

AT Columbia University the John Tyndall Fellowship has been awarded to Mr. Berger Davis of New York and the Barnard Fellowship to Mr. J. A. Matthews of Columbia University, now carrying on chemical research in London. University fellowships in the sciences have been awarded as follows:

Robert Henry Bradford, Salt Lake City, Utah, metallurgy.

William Austin Cannon, Washington, Mich., botany.

Fellowship in chemistry to be awarded to an alternate.

William Jones, Sac and Fox Agency, Oklahoma, anthropology.

James Franklin Messenger, Cambridge, Mass., psychology.

Austin Flint Rogers, New York, mineralogy.

Walter Stanborough Sutton, Kansas City, Kansas, zoology.

Charles Partridge Weston, Orono, Me., mechanics.

James Mickel Williams, New York, sociology.

DR. E. OVERTON, docent in the University of Zurich, has been called to an associate professorship of physiology in the University at Würzburg.

DR. F. REINITZER has been promoted to a full professorship of botany in the Technical Institute at Graz.